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Fifth List of Members of the History of Science Society **

Members elected from January 1, 1929 to July 1, 1930

BOBROVNIKOFF, NICHOLAS THEODORE, Ph. D., Perkins Observatory, Delaware, Ohio, 1930.

BLUMER, HERBERT, Ph. D., Instructor in Sociology, Faculty Exchange, University of Chicago, Chicago, Ill., 1930.

COLLIER, KATHARINE BURNELL, 282 De Kalb Avenue, Brooklyn, N. Y., 1930.

COUES, R. W., M. A., 3 Acacia Street, Cambridge, Mass., 1930.

DEMPSTER, ARTHUR JEFFREY, Ph. D., Professor of Physics, Ryerson Laboratory, University of Chicago, Chicago, Ill., 1929.

DENNING, Mrs. ARTHUR L., 8 Willard Street, Cambridge, Mass., 1930.

DIEPGEN, PAUL, Ph. D., Freiburg i. Br., Stadtstr. 6, Germany, 1930.

DONHAM, W. B., Ph. D., Dean's House, Soldiers Field Station, Boston, Mass., 1930.

DORSEY, GEORGE A., Director, School for Social Research, 35 W. 9th St., New York City, N. Y., 1930.

DUNLEVY, Miss BEATRICE, Teacher, Maxwell Training School of Teachers, 801 Park Place, Brooklyn, N. Y., 1930.

DYSON, Sir FRANK WATSON, Astronomer Royal, Royal Observatory, Greenwich, Eng., 1930.

FORD, J. D. M., Ph. D., Professor of Romance Languages, Harvard University, Cambridge, Mass., 1930.

FRANKFURTER, FELIX, Ph. D., Harvard Law School, Cambridge, Mass., 1930.

GEST, GUION M., Gest Chinese Research Library, 1336 Woolworth Bldg., New York City, N. Y., 1930.

GRAY, SAMUEL HAROLD, M. D., Associate Professor of Pathology, 4200 East Ninth Ave., Denver, Colorado, 1929.

** The previous list appeared in *Isis*, 12, 179-183, 1929.

GRISWOLD, CLIFFORD STANDISH, Master in Science, Groton School, Groton, Mass., 1929.

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HOAGLAND, HUDSON, Ph. D., Laboratory of General Physiology, Harvard University, Cambridge, Mass., 1930.

KAPLAN, EMANUEL B., M. D., 2200 Powell Avenue, New York City, N. Y., 1929.

KARAPETOFF, VLADIMIR, Ph. D., Professor at Cornell University, 520 E. Buffalo St., Ithaca, N. Y., 1929.

KAST, LUDWIG, M. D., President of Josiah Mary Jr. Foundation, 521 Park Avenue, New York City, N. Y., 1930.

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MCEWAN, CALVIN W., Ph. D., Professor of History, 223 Alumni Hall, University of Pittsburgh, Pittsburgh, Penna, 1929.

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MAY, CHARLES D., Student in Harvard University, 6 Hilliard Street, Cambridge, Mass., 1930.

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PARSON, GEORGE, Acting Director, Bureau of Operations, U. S. Shipping Board, East Falls Church, Va., 1929.

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SARD, FREDERICK N., Organizer of Centennials, 230 West 15 Street, New York City, N. Y., 1930.

SEYBOLT, ROBERT FRANCIS, Ph. D., Professor of History of Education, University of Illinois, Urbana, Ill., 1929.

SHANER, RALPH FAUST, M. D., Professor of Anatomy, University of Alberta, 11608 — 93 Avenue, Edmonton, Alberta, Canada, 1930.

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THORNE, SAMUEL E., Student of Law, 21 Perkins Hall, Cambridge, Mass., 1929.

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WALKER, EVELYN, Ph. D., Associate Professor in Mathematics, 35 West 82 Street, New York City, N. Y., 1930.

WALKER, JOSEPH FREDERIC, JR., Ph. D., Research Chemist, 91 Gordon Street, Perth Amboy, New Jersey, 1930.

WEISS, HARRY BISCHOFF, Ph. D., Statistician and entomologist, 19 North 7th Avenue, New Brunswick, N. J., 1929.

WELLMANN, MAX, Ph. D., Waisenstr. 46, Potsdam 15, Germany, 1930.

WELLS, H. GIDEON, M. D., Director of Medical Research, Sprague Memorial Institute, University of Chicago, Chicago, Ill., 1929.

WHITE, A. H., Esq., Ass't Librarian, The Royal Society, Burlington House, London, (W), 1930.

WILSON, PHILLIP D., M. D., Physician, 372 Marlborough Street, Boston, Mass., 1930.

WOODWARD, HERBERT PRESTON, Ph. D., Professor of Geology, Dana College, 376 Prospect Street, East Orange, N. J., 1930.

WU, LU-CHIANG, Student, Research Laboratory of Organic Chemistry, Mass. Inst. of Technology, Cambridge, Mass., 1929.

ZINNER, ERNST, Ph. D., Remeis-Sternwarte, Bamberg, Germany, 1930.

ZWARENSTEIN, H., M. D., Senior Lecturer in the Dept. of Physiology, Medical School, Mowbray, Cape Town, Africa, 1929.

Institutional Members

Belorusskaya Derzhavnaya Biblioteka, Sovetskaya, 94, Minsk, U. S. S. R., 1929.

Brother College Library, Drew University, Madison, N. J., 1929.

Carnegie Corporation of New York, Dr. F. P. KEPPEL, President. 522 Fifth Ave., New York City, N. Y., 1929.

Cincinnati University Library, Burnet Woods Park, Cincinnati, Ohio, 1929.

Duke University Library, J. BREEDLOVE, Librarian, Durham, North Carolina, 1930.

Harvard Club of Boston, Library, 374 Commonwealth Ave,. Boston, Mass., 1930.

Iberica (rev. semanal : el Progreso de la ciencias y de sus applicaciones); Calle Palau, 3, Apartado 143, Barcelona, Espagne, 1929.

Institut Adr. Guebhard Severine, Director EMILE MÜHLESTEIN, Ph. D., 60 Chemin du Haut, Bienne, Switzerland, 1930.

Institut des Hautes Études Marocaines (M. A. LEVI-PROVENÇAL) Rabat, Maroc, 1929.

Library, Department of Physics, Physics Building, University of Toronto, Toronto, Canada, 1930.

Mathematisches Seminar der Universität Berlin, Berlin C2, Germany, 1930.

Miami University Library, Oxford, Ohio, 1930.

Musées Royaux d'Art et d'Histoire, Parc du Cinquantenaire, Bruxelles, Belgium, 1929.

Occidental College Library, E. J. MCCLORY, Librarian, Los Angeles, Calif., 1929.

Ohio Wesleyan University, Library, Delaware, Ohio, 1930.

Public Library of Los Angeles, EVERETT R. PERRY, Librarian, Los Angeles, Calif., 1930.

Rosenwald Industrial Museum, 300 West Adams Street, Chicago, Ill., 1929.

Stadtbibliothek, Zurich, Switzerland, 1930.

Bishop Fulbert : Teacher, administrator, humanist

There is an oft-repeated assertion to the effect that it was, in the Middle Ages, an absolute impossibility for any bishop to satisfactorily perform the double function of temporal and spiritual prelate. FULBERT, bishop of Chartres from 1008 to his death in 1028, was however an inspiring example of the rather rare type of churchman whose career is a happy exception to the rule. A survey of his varied activities, first as head of a great theological school, second as an authority on ecclesiastical and feudal law, and third as a scholar and gentleman of culture, will serve not only as substantiation for this fact, but also as evidence of the eternal impossibility of restricting a really able clergyman to non-secular activities. (1)

The place and date of FULBERT's birth are both matters of considerable dispute. No conclusive decision, it seems, can be obtained on the basis of the evidence available at present, though it may be said that the preponderence of conjecture favors Italy, at some date between 960 and 970. Of only one fact concerning his early life, may we speak with certainty. According to his own verses *De Seipso*, FULBERT was born of poor and obscure

(1) This study is a revision of a paper read before the Sixth Annual Literary Meeting of the American Society of Church History, at Evanston, Illinois, 1930. It is based on a first-hand acquaintance with the letters, poems, and other writings of FULBERT, which the author, in collaboration with Miss FRANCES HARPER of Baton Rouge High School, is translating for the Columbia University « Records of Civilization ». FULBERT's works can be most easily consulted in the latin edition of MIGNE, *Patrologia Latina*... (Paris, 1880), vol. 141, col. 189-354. The letters quoted herewith are cited by the numbers used in the MIGNE edition. The only serious biography of FULBERT is CH. PFISTER's *De Fulberti Carnotensis Episcopi Vita et Operibus* (Nancy, 1886). The only work in English that does anything but refer to separate phases of FULBERT's writings, is Miss HILDA JOHNSTONE's brief but excellent study in the *Church Quarterly Review*, of April, 1926.

parents. Like GERBERT and many another son of ignoble parents, he rose to a well deserved position of prominence through the agency of the church schools which offered an excellent opportunity for merit and ambition to win advancement. After studying at Rheims under Master GERBERT, due to a close friendship with HERIBERT the musician and to the medical reputation of HERIBRAND, another Chartrain, FULBERT moved to the city whose fame was to be so enhanced by his career. This transit from Rheims to Chartres is significant. During the late tenth century many young scholars drifted thither from other French schools, and soon under FULBERT's benign yet efficient leadership Chartres became the outstanding educational center of Gaul.

From his arrival at Chartres to the time of his death, FULBERT was, first and foremost, a great teacher. Until the year 1004, his career lies hidden in the tantalizing mists of conjecture. It is reasonably certain that he spent most of the last decade of the tenth century as an instructor in the cathedral school, and that he held various minor offices that led up to the deaconate, for in 1004 he became deacon of the chapter of St. Mary's Church. During the episcopate of RUDOLPH (1003-1007), he attained the position of chancellor of the chapter, a capacity in which he assumed the leadership of a group of scholars who were soon to bring great honor to the school. Among the manifold duties of this office there was one that is significant of FULBERT's own career, of that of many another medieval scholar, and of the democratic organization of the church schools. Chancellor FULBERT had charge of the distribution of provisions as well as instruction, to poor students.

In 1008, on the death of RUDOLPH, FULBERT became bishop. After attaining the episcopate he seems to have devoted himself even more assiduously than before, to the task of directing his group of young disciples in the paths of orthodox learning. To him, the task of teaching was a serious one. He once warned his friend and former pupil, HILDEGAIRE against « mixing unseemly levity with the teaching of grammar » (Letter LXIII) He possessed the rare ability of being able to express pedagogical disapproval in a constructive manner. Sometimes, instead of reprimanding a student directly, he would merely disregard him, a procedure of which ANGELRAN said : « When we wasted our talents, we

no longer deserved to hear your sweet words 'well done'; your saintly constancy was no whit less, but our negligence was justly punished by being cut off from much-needed instruction ». (2)

FULBERT was not, however, primarily a disciplinarian; in fact the dominant characteristic of his teaching seems to have been his power to inspire. He was strongly imbued with that sympathetic human quality that leads the born teacher to instinctively subordinate subject matter to personality, and mere mentality to moral character. ADELMAN, in his alphabetical poem, paid high tribute to the beloved master's « diligent dignity, his grave demeanor, and his gentleness of speech as he unfolded the higher mysteries of learning ». FULBERT's wisdom and restraint, his kindly spirit, his sincere interest in students invariably won not only their respect, but also their heartfelt adoration. Whereas most schoolmasters taught in a formal manner, he was accustomed to walk in the chapter garden with his pupils, discoursing the while on the deeper things of sacred and secular learning. Long afterwards, ADELMAN, in exhorting BERENGAR to return to the orthodox beliefs of his fellow students, called to mind bygone days « in the Academy at Chartres under our charming and venerable Socrates », and « the solitary evening discussions in the garden near the chapel ». FULBERT's methods of imparting wisdom, his unique humility of manner, and the worshipful attitude of his disciples, more closely approximates our conception of the Teacher of Nazareth or the ancient Greek philosophers, than that of the traditional medieval schoolmen. It was with a simple, kindly, human touch that FULBERT entered into the lives of his followers, ministering to their daily needs, supervising their studies, and correcting their mistakes. One of them wrote appreciatively of the time when the venerable bishop, chancing to pass his way, stopped to explain a difficult problem in geometry; on another occasion, however, FULBERT propounded to him a question concerning interior angles, and when he was unable to answer, refused to give the solution, calling his attention to the fact that his fellow students knew it.

It is not strange that FULBERT had an inner circle of disciples who had proved themselves worthy of special favors and capable

(2) MIGNE, P. L., vol. 141, col. 1423.

of unusual attainments. He loved to call together this intimate group for heart to heart discussions. In his later years, at vespers in the new church, he often warned them of the dangerously unorthodox ideas that seemed to be creeping into the Gallic Church, and even into their own circle. These conferences were, it seems, predominantly theological, with constant emphasis on the spiritual needs of the disciples and on the importance of upholding the traditions of the Fathers and the authority of the Church. Perhaps it would not be considered sacrilegious, or even extravagant, to suggest that we have, in FULBERT's School of Chartres, an eleventh-century fundamentalist theological seminary. It is barely possible that the worries of the aged bishop might find an echo in the heart of more than one twentieth-century dean whose path is beset with similar problems of modernistic rationalism and seminary administration.

It is evident that the head of the school at Chartres had his administrative troubles. For instance, the students were organized into a semi-monastic corporation, the management of which was no small worry. Chapel attendance was evidently a problem, for one of HILDEGAIRE's letters hints at the difficulty of getting the students to celebrate the canonical hours. Then there were always financial problems of one sort or another. Since the cleric-scholars lived together as regular canons, there were no regular prebends, except for the professors, who were provided for from the diocesan revenues. Needy students were, as always, a problem. The charity of the local chapter provided a fund for local students, but foreigners were forced to rely on their own resources. Some of them lived with resident masters or canons, with whom they sometimes failed to settle their accounts, as in the case of SIGFRED of Rouen to whom HILDEGAIRE sent at least two dunning letters. FULBERT's correspondence also contains hints to the effect that it was often difficult to make revenues meet expenses, even before the great fire which forced him to undertake a formidable drive for money with which to rebuild St. Mary's Church.

A far more pleasant duty was that of maintaining contacts with, and for, the alumni. When one of them, HUBERT by name, went to Rheims to study, FULBERT wrote a letter recommending the young man to his friend Archbishop EBAL. To another bishop

he sent a request that one of his favorites, ADELMAN, who had been recalled, should be allowed to return to Chartres. The lengthy correspondence between FULBERT and HILDEGAIRE, during the latter's enforced absence at Poitiers to perform FULBERT's duties as treasurer of St. Hilary, indicates the close ties of mutual respect and love that existed between this schoolmaster and his former students. FULBERT's letters of advice and detailed instruction, were filled with expressions of affectionate pride. HILDEGAIRE, in turn, lamented the separation, likening himself to « the hart that panteth after the waterbrooks ». Meanwhile he was absenting himself from Poitiers in order to make protracted visits at Chartres, and finally FULBERT himself wrote to Duke WILLIAM excusing his proxy for neglect of duty on the ground that « he has not yet drunk long enough at our breasts to be refreshed in spirit ». Eventually FULBERT gave up the treasurership of St. Hilary's, and HILDEGAIRE wrote a letter of resignation in which he scarcely concealed his joy. Now, as FULBERT's chancellor, he was able to renew the happy associations with his beloved master and with such soul-mates as « his most beloved frater EVRARD », *animae meae dimidium* HILDUIN, (3) and FULBERT's own « beloved disciple » SIGON, to whom HILDEGAIRE was wont to send « hundreds of thousands of greetings ».

But it must not be inferred that FULBERT was merely the placid leader of a pious mutual admiration society. He was throughout his career, the outstanding leader of French religious thought. Theology was his major intellectual interest, and ADELMAN spoke truly when he called him *Doctor Catholicus*. He was a close student of the Scriptures, and both his formal treatises and exegetical letters are liberally supplied with well-chosen quotations from the Old and New Testament. He showed ability and care in textual criticism, even to the extent of an occasional delving into Greek and Hebrew derivations. His chief method of exposition was, of course, the mobilization of authorities. For instance, in answer to a question from Duke WILLIAM OF POITOU regarding SOLOMON, he merely sent three long quotations from BACHARIUS, BEDE, and RABANUS MAURUS. The Ante-Nicene and Post-Nicene

(3) This seems to be from HORACE, Odes, Book I, Ode 3, concerning VERGIL; which reads *animae dimidium meae*.

Greek Fathers seem to have been unknown to FULBERT, but he constantly referred to AUGUSTINE, CYPRIAN, AMBROSE, GREGORY THE GREAT, and the lesser Fathers of the Latin Church. Furthermore, he frequently quoted or cited the great theologians of later centuries, such as ISIDORE OF SEVILLE, BEDE, and RABANUS MAURUS.

Like most of his contemporaries, once the literal meaning of a passage had been set forth, FULBERT was accustomed to make ample spiritual applications and to draw innumerable lessons and allegorical interpretations. The scholastic orthodoxy of his theological mind is interestingly illustrated in the long treatise-sermon from the text Acts 12:1. Referring to the account of PETER's escape from prison, he said : « The narrative is certainly worthy of credence as history, and is to be accepted literally... but it does not seem unsuitable to shew after what spiritual fashion the whole may be interpreted, while still preserving historical truth ». According to his « spiritual fashion », HEROD signified the Devil; the Jews, his assistants; PETER, the constant mind which though temporarily imprisoned by said Devil and assistants, is eventually released from temptation, (i.e., prison) by an angel; this angel leads the sinner to the iron gate of penance which opens to deliver him. One finds the even more fanciful imagery of the true mystic in a part of one of FULBERT's letters concerning the real presence in the Mass.

« Taste (he says), Taste (gusta) and see how sweet this food is; taste thoroughly (pergusta) of its savoriness. It savors, if I am not mistaken, of that angelic food... which you taste, not with the mouth, but with the inner feeling. Thrust forth the palate of faith, extend the jaws of hope, spread out the inward parts of charity and take the bread of life, this nourishment for the inner man, this food unspoiled by the baker's art, this life-giving food of incarnate deity. Take also the wine, untrodden by filthy husbandman, but pressed from the very cross... Surely through the inpouring of the saving Eucharist, Christ flows into the innermost parts of the soul... So he enteres into the pleasant habitation of the communicant... and refreshes his soul with as many odors, so to speak, of sweetness as the eye of meditation is worthy to gaze upon in this beauteous and intimate revelation... » (Letter V)

This same food-complex appears again in one of the most

saccharinely obsequious of all his letters; a note thanking his idolized friend Abbot ODILO OF CLUNY for certain complimentary remarks. These words of appreciation, says FULBERT, show forth a splendor that is

« more festive than one would have expected at a banquet of Solomon, or among the instruments of the poets, or the glowing candles of virgins. You have placed before me angelic manna, with a mystical feast of pigeons and turtledoves... and the nectar of love... » (Letter CVI)

It is obvious that the school dominated by one whose mind tended to such mystical rhapsodies would perforce be a center of conservative theology. As a matter of fact, during FULBERT's own century, Chartres was the field for the preliminary skirmishes of the great philosophical battle over universals. Here the age-long conflict between modernists and fundamentalists was continued along lines that were destined eventually to attract the attention and mental acumen of many of the greatest minds of the High Middle Age. Even as early as the eleventh century, France was familiar with the theory of realism, and supporters of this brand of fundamentalism were already referred to as *antiqui doctores*. (4)

No one who has read FULBERT's theological treatises can doubt that he belonged with the scholastic philosophers of the extreme Right. In the introduction to a letter on the Trinity, Baptism, and the Eucharist, he wrote :

« The depths of the mysteries of God are revealed, not to human reason, but to the eyes of faith. Those who contemplate these three things from the standpoint of carnal sense (*carnalem sensum*) rather than faith ...fall over the steep and ruinous precipice of error... » (Letter V)

Indeed, such warnings were needed, for in the very midst of his own charmed circle there were brilliant young thinkers whose minds were fascinated by this same sort of « *carnal* » rationalism. By following the path of pure reason even in the study of these « sacred mysteries », BERENGAR OF TOURS and JOHN the Deaf of Chartres were developing alarming theories concerning the real presence. As long as FULBERT was alive there was no

(4) *M. G. SS.*, XIV, 275.

open break, though one senses a definite rift among the disciples.

With the passing of FULBERT, according to the biographer of St. ODILO, « the study of philosophy in France perished ». One must, of course, reject such a sweeping generalization, but in the light of the facts, it can scarcely be doubted that Chartres as the leading center of conservative theology did suffer a severe blow. It was from other places that the attacks on BERENGAR's radicalism were launched. Even the earnest appeals of his former schoolmates came, not from the old school itself, but from ex-Chartrains in distant cities. It seems reasonably clear that the period in which FULBERT was laying the foundations of realism in Chartres saw also the beginnings of contrary tendencies. After leaving Chartres, BERENGAR established a following of rationalistic thinkers in and about Tours. It is also possible that, at about the same time, the famous ROSCELIN was studying under FULBERT's former student, JOHN OF CHARTRES. Far be it from us to attempt to trace the origin of *nominalism* to FULBERT, for the same fountainhead can hardly be made responsible for both fresh and salt water. It is, however, quite clear that, from the beginning of the eleventh century, the cross currents of conservative and radical philosophy were running strong in France, and that the School of FULBERT was by no means unshaken in its orthodoxy.

By the end of the century the lines were definitely drawn. A combination of moderates and fundamentalists had finally succeeded in downing the extremists but only after controversies and councils that extended through many hectic years. Under the able leadership of LANFRANC and ANSELM, the orthodox position had been consolidated and FULBERT's skirmish troops had become a strongly entrenched army. The enemy, now scattered and reduced to guerilla warfare, merely evoked disdainful comments from the orthodox ranks. ORDERICUS VITALIS referred to them as « frothy grammarians », and OTHLO OF ST. EMMERAN vented his sarcasm on « these dialecticians who take no notice of any authority... putting their trust in BOETHIUS rather than the sacred Scriptures ». (5) It was however, the biographer HERIMAN, a rock-ribbed realist, who delivered the coup de grace to the rationalists in a manner that would win the applause of the modern

(5) MIGNE, *P. L.*, vol. 146, col. 60.

fundamentalist. He boasted that his master, ODO OF TOURNAI, « taught his disciples their dialectic after the manner of the ancient doctors of realism rather than in imitation of these modernists (quosdam modernos) who teach nominalism and who are proud spirits with excessive pretentions, having no other object but to get themselves looked up to as wise men ». (6)

Turning to the more practical realm of episcopal administration, we find a surprisingly different FULBERT. Here the orthodox theological pedagogue becomes the aggressive man of affairs. In the field of canon law, he not only proved his versatility of intellectual interests, but rendered an outstanding service to the Gallican Church. That he was a master canonist, is shown by the fact that he was looked up to by fellow churchmen as an authority on legal matters. He wrote treatises on « The Penance of Laymen » and « The Penance of Women »; and his letters written in answer to various technical queries, often took the form of constructive legal briefs, involving keen analysis, as well as accurate citations of precedents and authorities. Even in considering endless questions of wearisome detail, such as the canonical aspects of marriage, episcopal elections, etc., FULBERT's acute reasoning, his keen sense of justice, and his unfailing subordination of technicalities to practical needs, proclaim him a man of real constructive vision, with a mind of no narrow gauge. For instance, in the case of a priest who failed to communicate as he celebrated mass, FULBERT immediately took up the matter of intention; whether he had abstained because of unbelief, unconfessed sins, fear of drunkenness, or mere gastronomical nausea. « The case (he concluded) should be considered calmly and reasonably in accordance with these, or any other factors that might come to light ». In the still more serious case of a deacon who had masqueraded as a priest and celebrated Mass, FULBERT emphasized « the quality of mercy ». After citing the Old-Testament penalties suffered by the counterfeit priests KORE, DATHAN, and ABIRON, he gave an inspiring interpretation of the constructive aim and ideal of the law of Christ.

« But, (he wrote) since our Savior who came to save those who have perished, does not wish any sinner to die, but rather to be converted

(6) *M. G. SS.*, XIV, 275.

and live, it is mercifully provided that such (as this deacon) should be degraded and do penance among the laity... the canons leave the (length of) the penance to... the judgment of the bishop, for in the sight of the Lord, the measure of time does not avail so much as the measure of grief; nor abstinence from food so much as the starving of the vices ». (Letter XCIX)

In many a case, FULBERT insisted on « justice for the poor », the « stewardship of the needy », and « the care of the Lord's flock », as the supreme duty of the clergy.

One must not, however, get the impression that FULBERT was a weak-willed, soft hearted sentimentalist. He stood like a rock for the authority and rights of the clergy, at the same time insisting that they must live up to their high and holy responsibility. Woe to the corrupt or ambitious bishop, priest, or monk, whether great or small, whose tainted record was subjected to the tender mercies of FULBERT in righteous wrath. AZELIN OF PARIS, a truculent, scheming bishop of the worst sort, after many warnings and admonitions, was finally given a well deserved « pen-lashing ».

« As long as you write such things (said FULBERT, in reference to his whining excuses) you are ungrateful to those who deserve well of you... Cease wearying kings and prelates with your tiresome and oft-repeated complaints; cease trying to force yourself violently upon the Church of Paris, which confesses that it was neither happy at having you for its patron, nor grieved at losing you ». (Letter XXXV)

The archdeacon of the same church, a man of similar ilk, suffered an even worse flaying, in an open letter to the Paris clergy, which they were asked to show to the culprit himself.

FULBERT's own superiors often felt the rapier point of his keen and conscientious legal mind, and those who had the temerity to try disciplinary retaliation, usually found him a legalist who was not to be trifled with. In a righteously indignant answer to certain criticisms from Abbot-Archbishop GAUZELIN OF BOURGES, FULBERT began by suggesting that his critic « should not question his actions... but rather consider the facts of the case ». Then after quickly disposing of the archbishop's charges he issued his own challenge « if anyone accuses me of presumptuousness... I am prepared to prove my contention by reason as well as by authority ». (Letter XXXVI).

To his own archbishop, LEOTHERIC OF SENS, primate of all Gaul, FULBERT must have been a veritable nightmare, for he never hesitated to point out with obsequious humility and diabolically embarrassing keenness,the faults in his superior's policies. There seem to have been plenty of such opportunities, but LEOTHERIC, evidently realizing the value of good guidance, took bitter pills of criticism with surprisingly good grace. On one such occasion, FULBERT thanked LEOTHERIC for *his* suggestions and added :

« But in this case... I need no advisor. If you had been willing to take my advice on this matter earlier... our order and your own affairs would have been better off. But, I overlook the past and have the highest hopes for the future, in that you are now taking action along with... Father ODILO... I am ready to obey and assist you in all good things ». (Letter LXXV)

On another occasion, he administered what might almost be called a « paternal spanking » to the erring primate.

« That which was done long ago in the case of THEODORIC (OF ORLEANS), you have recently repeated in connection with G. who was appointed as pastor by you in such a manner that neither does he know the flock entrusted to his care, nor does the flock care to receive him... I am not so much astonished at that youth's being so tempted by ambition... It is clear that I ought not to keep silence in this (matter)... It is evident that you were a transgressor in two ways, since by inciting him to such great presumption you (also) freed him from the penalty of his previous guilt. Therefore you ought to come to yourself and repent of these (mistakes) and (others) of this nature... Perchance I seem to speak harshly; in your case, however, I believe it is deserved... Now in closing I wish to ask that you will not henceforth, (as has been your wont) make enemies for me by making public what I have written ». (Letter XXVIII)

In several of FULBERT's references to the « Lord Pope » one senses the same independence of spirit; a reminder of the Gallicanism of his predecessors HINCMAR and GERBERT. Encroachments upon the established prerogatives of the bishops never failed to rouse the sleeping lion. In the case of the pope, FULBERT's resistance was veiled, but upon members of the monastic clergy who encroached upon episcopal authority, he invariably loosed

a veritable storm of disapproval, accompanied by torrents of condemnatory authorities. Back in 1008, when GAUZELIN, (at that time a mere abbot) refused to recognize an excommunication by his bishop, FULBERT called upon him to submit, suggesting rather pointedly that he re-read, in the meantime, the « degrees of humility (in the Rule of St. Benedict) even up to the third ». His parting thrust was as follows :

« I can find no law nor method of reasoning that will free you from this yoke of (episcopal) subjection. If you or anyone else claims to have found it, I believe that he is some new logician who has not descended, but fallen from Heaven. » (Letter XVI)

To another presumptuous abbot he wrote :

« When was it granted to you to either dedicate a new church or to reconsecrate one that has been profaned? Why, you cannot even build an oratory without the consent of your bishop... who has authority to hand over an erring monk to Satan... Now, I wish to persuade you, in love, to return unconditionally to your bishop's jurisdiction and seek pardon... Otherwise you will suffer severe penalties in the next episcopal assembly ». (Letter XCI)

It is evident however that the doughty bishop knew the value of combining tact with coercion. Archbishop GAUZELIN, his perennial opponent, once received from him the gracious announcement : « You can readily obtain whatever you ask from me, so long as it is expedient. » The matter under consideration was evidently « expedient » for later on, in the same letter, FULBERT remarked; « I am yielding even though unconquered ». One of FULBERT's most evident compromises was, amusingly enough, in the case of a member of the weaker sex; « that sacrilegious woman of Laon » (as he called her). Tho she had plundered church property FULBERT refused the local bishop's request that he join in excommunicating her, on the curiously considerate ground that « there was no one who dared carry the excommunication to her... and it would do little or no good if she, without knowing it, were ex-communicated in *our* church... » One is tempted to place FULBERT, alongside ELIJAH, and the otherwise fearless prophets who have quailed before the wrath of women in positions of

authority. The queen of his friend and patron King ROBERT, seems to have been FULBERT's JEZEBEL. He once excused himself from attending the festivities in honor of her son, Prince HENRY on account of (so he wrote) « ill health... and the fierceness of the mother... She is, indeed, to be taken at her word, especially when she assures anyone of impending misfortune (at her hands); and her own past record is a sufficient pledge of her good (?) intentions ». (Letters XCVI, CII).

Such attitudes are indeed strange, particularly for a bishop with FULBERT's reputation for pitiless flaying of corruption among the clergy, and for successful championing of the clerical cause against lay aggressors in high places. In his relations with lay opponents of the stronger sex he never showed the white feather. The righteous old bishop was a fair fighter who handled obstreperous laymen, whether vassals or seigneurs, without gloves. Before joining in excommunicating the infamous FULK OF ANJOU, he wrote him saying : « I thought it was the honorable thing to warn you first ». Offenders who were willing to make amends, always found him quick to forgive. Defiant and confirmed culprits, after reasonable admonition, usually felt the force of his excommunication, and in some cases of the interdict. He also confidently summoned the lay nobles to stand shoulder to shoulder with him and his fellow-clergy in such matters. Count ODO OF CHARTRES, his immediate overlord, and King ROBERT THE PIOUS were often called upon to follow up his spiritual anathemas with physical coercion. ROBERT seldom failed him, for FULBERT was a faithful royal vassal, and a tower of moral strength for his friends and allies. The King, in turn, relied heavily on FULBERT for advice. Even in secular affairs the bishop's judgment was of great value and he was frequently in attendance at royal conferences, until advancing age, ill health, and increasing administrative burdens forced him to excuse himself. To the very end, however, he rendered valuable service, writing letters of frank criticism and honest commendation to « his most beloved and benign lord King. Several of FULBERT's secular letters were of great importance in feudal law. One of them formulated the duties of the vassal, and another was such an able commentary on the mutual responsibilities of lord and vassal that it became a recognized element of feudal law,

and appears today in most source books of medieval history. (7)

In this brief survey, our portrait of FULBERT as a scholar and gentleman of culture can barely be sketched in outline. Even after his *ars medicinae* was somewhat rusted from the disuse necessitated by administrative duties, FULBERT showed skill as a pharmacist. A letter to his friend Archbishop EBAL indicates the type of prescription that he was frequently called on to make.

« The hiera potion... is to be taken with hot water before twilight. That evening you must not eat; at night sprinkle... soft salt, to the weight of one scruple, into the potion. After taking it, sit quietly before the fire, avoiding drafts. It will do no harm to lie down for a while, but do not sleep. As soon as you feel *ventrem moveri* walk slowly to the *secessum*. Even if you are thirsty, do not drink anything except a little sour wine mixed with hot water, for your stomach must be rested (diluendum) and relieved (relevandum)... Avoid eating until the cathartic ceases to act... and then see to it that you do not overeat. Eat nothing that is constipating (stipticum) or excessively salted... » (Letter CXVIII)

In mathematics, astronomy, and natural science FULBERT was surprisingly well informed, but disappointingly lacking in the spirit of research. He, however, was a musical composer of such merit that several of his hymns are still used in the office of the church. His poetry was even more noteworthy, ranging from classic hexameters to the newer types of accented and rhymed verse. It is here that, one finds a hitherto undiscernable humanness of spirit. His « Legend of Abbot John » was a jolly jingle concerning the foibles of an ambitious but weak-willed monk who said :

« I'd like to live as angels do, In Heavenly security,
Unfed, unclad, dispensing with, The labors of mortality...
He spake, and took his clothing off, And went into the wilderness.
For seven days he painfully, Endured a grassy diet,
The eighth, his hunger drove him home, He could no more abide it... »

How often FULBERT must have chuckled in a manner most unbecoming to the « pillar of the Gallican Church », as he completed this limerick. But the beautiful « song of the Nightingale » reveals

(7) E. g., ROBINSON, *Readings in European History*, I.

an entirely different FULBERT; a poet of fine sensibilities, with a creative soul and an appreciation of the beauties of nature. If, as Miss WADDELL suggests, « Abbot John » makes us feel that « humanism is at the gates », (8) the Nightingale's « ecstasy of spring » and the haunting refrain of the latin lines surely brings humanism into the very guest chamber.

> « ...Philomela demus laudes in voce organica
> Dulce melos decantantes sicut docet musica... »

It has been said that this short lyric ushered in « a world of medieval poetry that is our very own »; it has been called the type of verse that is « free born », whose creators « neither imitate nor borrow ».

> « When the earth with spring returning buds again...
> Lilts the nightingale all passionate with sing ».

With the mere mention of FULBERT's further attainments as a writer of letters, as a pulpit orator, and as the builder of the local cult, crypt, and cathedral of the Virgin Mary, we must in all fairness admit that the great French medievalist LUCHAIRE was justified in characterizing FULBERT as a « grammarian, dialectician, rhetorician, epistolaire, poet, cosmographer, mathematician, canonist, and doctor who had acquired all the learning of his age ». (9) Some of FULBERT's own contemporaries must have sensed the fact that his versatility, human spiritedness, and well-balanced cultural background approached somewhat the ancient Greek ideal, for they called his school the « *Academy* of Chartres », and they honored him with the names « Plato » and « Socrates ». Is it necessary for the historian to apologize for what some might call their naive nomenclature; to explain that they were not aware of the fact that three centuries later PETRARCH would know a bit more Greek than FULBERT, and would be reading (and also rhapsodizing over) a much wider range of classical works; and that they had not been enlightened as to the awful darkness and lack of humanism in their « Dark » Ages, nor as to the sweep-

(8) WADDELL, HELEN, *The Wandering Scholars* (Boston, 1927), p. 89.
(9) LAVISSE, *Histoire de France* (Paris, 1901), vol. II, Part II, p. 113.

ing classical and cultural revival that was destined for the Italian « Renaissance »? No. FULBERT and his admirers need neither apologists nor detractors. In the light of scientific historical analysis, they and their age command the attention and respect of our modern era.

Bishop FULBERT, teacher, administrator, humanist; in some respects at least he must remain an enigma. This fundamentalist seminary pedagogue, this eleventh-century ecclesiastical man-of-affairs, Saul-like, is found among the troubadours and humanists, a not unworthy consort for Petrarch. Strangely, and yet naturally enough, « good things come out of Nazareth »; and out of the « Dark » Ages.

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The Astronomical Ceiling-decoration in the Tomb of Senmut

(XVIIIth DYNASTY)

ABSTRACT

The recently discovered astronomical ceiling-decoration in the tomb of SENMUT (XVIIIth dynasty; about 1500 B.C.) follows, in general, the same prototype as the well-known ceiling in the Ramesseum (XIXth dynasty; about 1250 B.C.); the ceiling of SETI I (XIXth dynasty; about 1300 B.C.) follows a different tradition. Both traditions contain elements of different antiquity.

Important new features of the SENMUT ceiling are the 12 monthly circles subdivided into 24 hourly sectors (unfinished « monthly star-charts »?), and the two « meridian cords » (connected with the ceremony of the « stretching of the cord » involving the observation of an upper culmination of Zeta Ursae Majoris?).

For a tentative identification of several stars and constellations represented in the circumpolar group of the northern panel or mentioned in the decanologue of the southern panel, a celestial globe was used. The precession of the equinoxes was taken care of by the drilling of several pairs of polar holes; the latitude of Thebes was taken as the altitude of the pole. A repetition of the experiment in a ZEISS planetarium is suggested.

The possibility of an exact dating of the three ceilings of the XVIIIth and XIXth dynasties by the use of their planetary data is pointed out.

1. *The tomb of Senmut.* (Plates A — D).

The oldest astronomical ceiling-decorations known to Egyptologists of the past century were those of the Ramesseum and of the tomb of SETI I, two monuments of the XIXth dynasty.

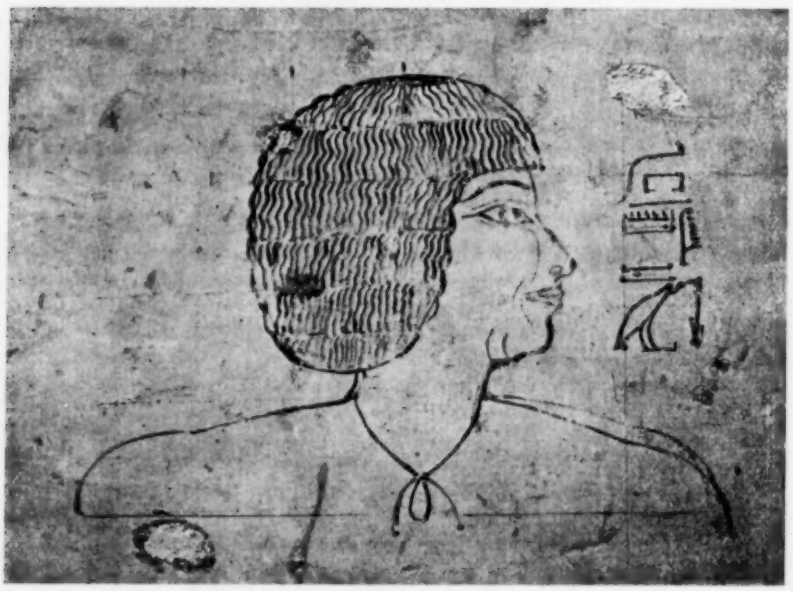
The ceiling of the Ramesseum is reproduced in Figs. 2a and 2b, according to E. WEIDENBACH's drawings (1) and lithographs, as published by LEPSIUS. (2)

The ceiling of the sepulchral hall of SETI I has been reproduced

(1) Prussian expedition, 1842-1845.

(2) C. R. LEPSIUS, *Denkmaeler aus Aegypten und Aethiopien*. III. Abt., Bl. 170, 171. (Date of publication uncertain, between 1849 and 1856 or 1859). The readings of several erasures were restored and several misreadings corrected by HEINRICH BRUGSCH, *Thesaurus Inscriptionum Aegyptiacarum*, p. 132, passim, 1883.

in *Isis* (VII, Pl. 6 and 7), from photographs by HARRY BURTON, of the staff of the Egyptian Expedition of the Metropolitan Museum of Art, which illustrated LUDLOW S. BULL's short paper, « An ancient Egyptian astronomical ceiling-decoration » (3); the paper was reprinted in extenso in the Sixteenth Critical Bibliography (4). « Due to the falling away of the natural limestone roof of the chamber », « large white areas » appear on the photographs of the SE corner of the ceiling of SETI I. Fortunately, the unwieldy folios of LEPSIUS contain a record of the presently missing parts. Our Fig. 3 reproduces the SE corner as it appears on E. WEIDENBACH's drawing and lithograph (5) of the SETI ceiling.



Fig, 1. The Steward of AMON, SENMUT. XVIIIth dynasty.

The tomb of SENMUT was discovered, during the 1925-1927 excavations at Thebes, by the Egyptian Expedition of the Metropolitan Museum of Art, and described by H. E. WINLOCK (6).

(3) *Bulletin of the Metropolitan Museum of Art*, New York, 1923, vol. 18, p. 283-286, with 7 figs.

(4) *Isis*, VII, 262-263, 1925.

(5) LEPSIUS, *Denkmaeler*, III, 137.

(6) *Section II of the Bulletin of the Metropolitan Museum of Art*, New York, February, 1928, p. 3-58, with 55 figs.

The astronomical ceiling-decoration in this empty tomb of the XVIIIth dynasty was discussed by GUENTHER ROEDER, Director of the PELIZAEUS-Museum in Hildesheim, in a paper entitled « Eine neue Darstellung des gestirnten Himmels in Aegypten aus der Zeit um 1500 v. Chr. » (7)

We are indebted to LUDLOW S. BULL for the photographs reproduced—with an unavoidable loss of detail—on the plates described in this paper.

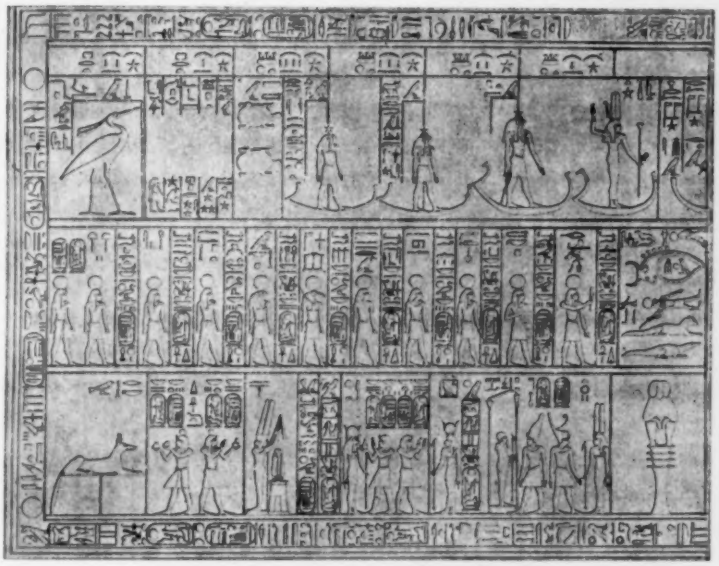


Fig. 2a. Ramesseum. XIXth dynasty.
Astronomical ceiling. Western part.

The choice of a method of transliteration acceptable to the English-reading non-Egyptologist, to the Egyptologist, and—last, but not least—to the printer, offered some difficulty. As the monumental ERMAN-GRAPOW (8) *Wörterbuch* is still under construction, the *Dictionary* of E. A. W. BUDGE (9) had to be consulted; although English-speaking Egyptologists may have reasons for

(7) *Das Weltall*, 28. Jahrgang, p. 1-5, with 5 figs., Berlin-Treptow, 1928.

(8) A. ERMAN, H. GRAPOW (editors): *Wörterbuch der Aegyptischen Sprache, im Auftrage der deutschen Akademien*. Complete in 8 Lieferungen or 4 volumes. Leipzig, 1925-193?

(9) E. A. W. BUDGE, *An Egyptian Hieroglyphic Dictionary*. London, 1920.

not adopting BUDGE's method as a standard of transliteration, it has been used with some simplifications in this paper. (10) More or less familiar names were rendered in the usual English transcription. As a rule, *variae lectiones* were not taken into consideration, although the possibility of their importance is obvious. The purpose of this paper is to give a description—from the astronomical point of view—of the recently discovered astrographic monument of the XVIIIth dynasty; an exhaustive study of the

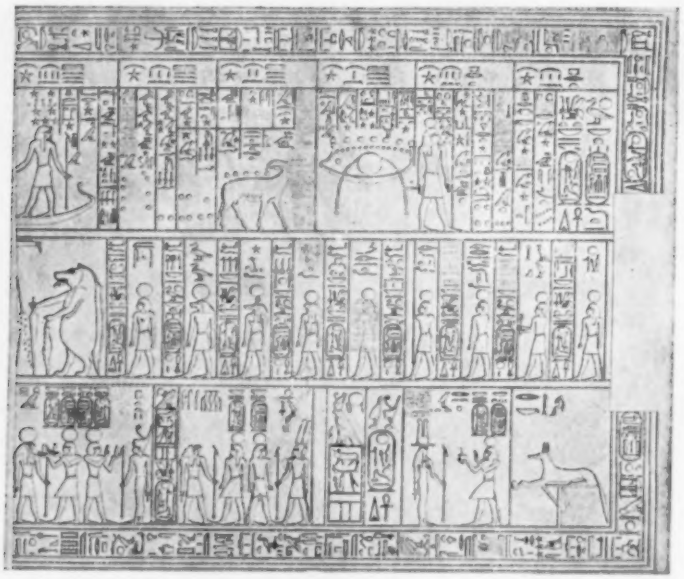


Fig. 2b. Ramesseum. XIXth Dynasty.
Astronomical ceiling. Eastern part.

new data must be reserved for the collaboration of an Egyptologist with an astronomer.

The reed-pen sketch of SENMUT (Fig. 1), preserved on the wall of the stairway leading to the first chamber in his empty tomb, is a good likeness of this « greatest of the great in the whole land », if one may judge by statues of him which can be found from Cairo to Chicago, and—as pointed out by WINLOCK—by the caricature found by LORD CARNARVON and HOWARD CARTER in

(10) In the hand-set Tables I-III, diacritical signs were retained.

a tomb near the temple of HATSHEPSUT (11). The importance of HATSHEPSUT's « privy councillor on the sovereign's right hand » is strikingly illustrated by an ostracon-memorandum (12) of the accounts of « the Pharao », « the Estate of the Queen », the « Treasurer », and—a name this time, not a title—« SENMUT »; as WINLOCK remarks, THUTMOSE, HATSHEPSUT, and the treasurer were merely institutions to the bookkeeper, « but SENMUT needed no title to explain who he might be »; it could be added that

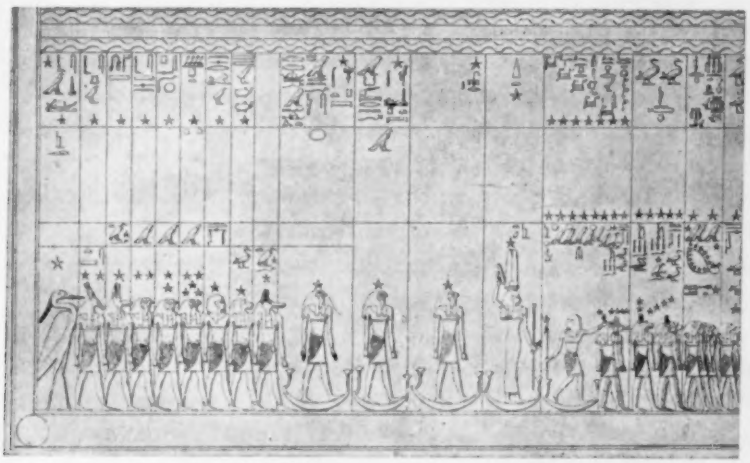


Fig. 3. Sepulcral hall of SETI I. XIXth dynasty.
Astronomical ceiling. Southern panel. Eastern part.

the items listed against him and the treasurer exceed those listed against their royal masters. The builder of HATSHEPSUT's temple fell into disgrace before the tomb which he was burrowing for himself was completed; chips and rubbish barred the quarry entrance to the stairway during the last thirty-four centuries. Fortunately, the decoration of the third—and last—chamber, at the bottom of the third flight of stairs, about one hundred meters from the top-step, was almost complete. The sculptured walls were inspected on the 29th day of the fourth month of Inundation, and the date written, in black ink, across each column of hiero-

(11) HATSHEPSUT was the co-regent of her father, THUTMOSE I; of her brother and consort, THUTMOSE II; and of her nephew, THUTMOSE III. These kings of the XVIIIth dynasty lived in the middle of the second millennium B.C.

(12) H. E. WINLOCK, loc. cit., fig. 54.

glyphs, at the corresponding height. « It would be interesting », says WINLOCK, « if we could only prove that the handwriting was that of the Superintendent of All the Royal Works, SENMUT himself. »

The size of the third chamber is not stated in WINLOCK's paper, but from the scale of his plan of the two temples at Deir el Bahri, (13) and from an estimate of the height and the width of the entrance to the tomb of SENMUT (14), the size of the slightly vaulted ceiling must be about 10 × 12 ft. The three flights of stairs lead in an east-and-west direction. The chipped-off part of the ceiling (Pl. A, B and especially C), at the entrance to the chamber, is at the eastern end of the central band which separates the northern and southern panels of the ceiling.

This division of an astronomical ceiling into two panels by a central east-and-west band is known from tombs of later date, and is analogous to the lay-out of the decorations found on some sarcophagus-lids. A characteristic feature of the SENMUT ceiling is the astronomically objectionable orientation of the southern panel; it has to be inspected, like the rest of the ceiling, by a person facing north, so that Orion appears east of Sirius. If astronomical ceilings in sepulchral halls were originally but an expansion of the inside and outside decorations of sarcophagus-lids, the reversed orientation of the southern panel would be easy to account for. Another explanation for the wrong orientation of the southern panel is suggested by the possibility that it originated on a southern vertical wall facing a northern vertical wall appropriately decorated with representations of the « meridian cords » and the « mural dials » discussed below; by moving such hypothetical mural panels to the ceiling, their relative orientation could be preserved, as in the case of the SETI monument, or else the orientation of the southern panel (15) could be sacrified to « uniformity », as on the ceilings of SENMUT and of the Ramesseum. To settle these—and many other questions—we need more and older tombs and sarcophagi with astronomical decorations.

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(13) H. E. WINLOCK, loc. cit., fig. 29.

(14) H. E. WINLOCK, loc. cit., figs. 33, 36, and 55.

(15) The northern panel could not be turned around and placed « above » the southern panel of the ceiling without causing very objectionable changes in the relative position of the pole and of the horizon.

The central strip of the SENMUT ceiling is reproduced, for the sake of completeness, on Pls. C and D. Its contents are necrological rather than astrological; the cartouche of HATSHEPSUT, near the center, could serve for the dating of the ceiling, even if we had no other proofs that the tomb was built and the sepulchral hall decorated while SENMUT was the « right hand » of the first great woman of recorded history.

A border of five-pointed stars surrounds each panel of the ceiling of SENMUT. Circles are represented in the four corners, as on the ceiling of SETI I. We miss on the SENMUT monument the dark background which transforms the SETI ceiling into a starry sky, and the little circles at the joints of the figures which make the SETI divinities look to us like articulated toys. The light background and the unfinished state of the SENMUT ceiling offer us the compensation of showing the draftsman at work: the auxiliary lines (16) give us a better understanding of his technique as a decorator (17) and of the extent—or should we say limitations?—of his knowledge of mathematics (18).

The tomb of SENMUT, as we have seen, was not accessible to the craftsmen who worked on the decoration of the Ramesseum a quarter of a millennium later. The features common to both monuments are, therefore, derived from a common tradition which is, as we shall see, different from the one followed two centuries after SENMUT by the decorators (19) of the sepulchral hall of SETI I.

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(16) Especially on the northern panel, pl. E-G. The general view of the ceiling, pl. B, is composed of eight photographs, and their joints should not be confused with the auxiliary lines left by the draftsman.

(17) His ideas of an ideal composition rather than astronomical considerations are responsible for the alignment, on a line « parallel » to the western « meridian cord », of the following items: tip of the crocodile's tail, finger-tips of the little hand, club, elbow, lance emerging from behind the hawk-head, base of the bull's horns, tips of the scorpion's claws. It is a curious coincidence that the club just mentioned closely resembles the whip-handle of « The Sailor of SENMUT, NEBIRI » (*Part II of the Bulletin of the M. M. A.*, December, 1923, fig. 26) which shows « traces of two straps coming out of the hole » (loc. cit., p. 32).

(18) His subdivision of a circle in 24 parts, and of the space allotted to a divinity, in 9½ parts. The development of our knowledge of Egyptian mathematics is shown in R. C. ARCHIBALD's *Bibliography of Egyptian (and Babylonian) mathematics*, in the two volumes of the CHACE-BULL-MANNING edition of the RHIND Mathematical Papyrus, Oberlin, Ohio, 1927 and 1929 (*Isis*, 14, 251-55).

(19) There are reasons to believe that this ceiling-decoration is the work of at least two craftsmen.

The relative antiquity of the two traditions is not easy to determine : both of them contain very old and relatively recent elements. It can be said, however, that the northern panel of SENMUT is characterized by several features which reflect older traditions than those found on the northern panel of SETI, while the southern panel of SETI, on the other hand, appears to reflect traditions which must be older than those of the southern panel of SENMUT. It is possible that the oldest elements of SETI's southern panel are older than the oldest elements of SENMUT's northern panel.

Whatever the correct answer to the question of the relative antiquity of traditions may be, the tomb of SENMUT contains the oldest known astronomical ceiling; some features of this ceiling are entirely new to us, others throw new light into familiar dark corners of Egyptian astronomy, chronology, and mythology.

2. *The circumpolar constellations.* (Plate F).

Between 3000 and 1500 B. C., the precession of the equinoxes carried the celestial north pole across that part of the constellation Draco which is about half-way between the body of Ursa Minor and the tail of Ursa Major. About 3000 B. C., in the latitude of Thebes, the tip of the tail of Ursa Minor—our Polaris—grazed the horizon at its lower culmination; the vernal equinox was then in Taurus, and the celestial equator passed north of Aldebaran, near Procyon, south of Corvus, north of Antares, near Theta Aquilae, through the square of Pegasus, and through the Pleiades. A 6-inch celestial globe with several pairs of « polar » holes—not time-wasting computations—gave this information (20).

The northern constellations represented in the center of the northern panel (Pl. F) remind us of the corresponding group of figures in the Ramesseum (Fig. 2a and 2b); a glance at Fig. 5 in *Isis*, VII, Pl. 7, suffices to show the difference between the SETI group on the one hand, and the SENMUT-Ramesseum tradition, on the other. The SENMUT and the Ramesseum craftsmen

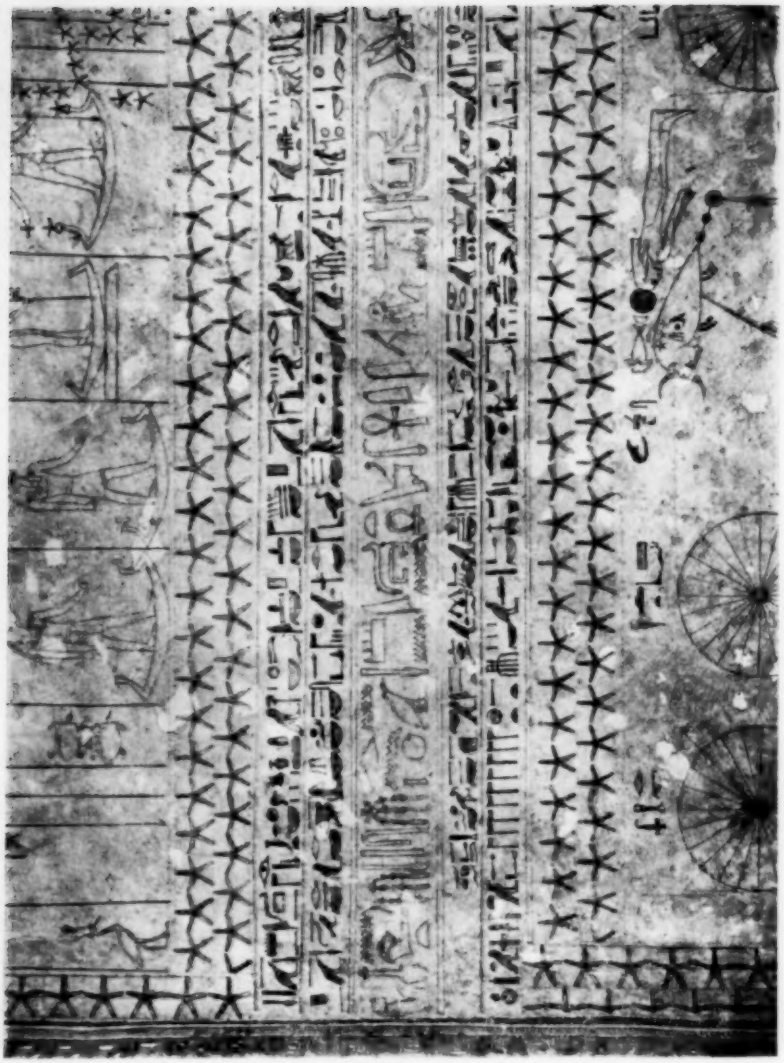
(20) Manufactured by G. PHILIP & SON, 32 Fleet St., London. The gores correspond to maps of an ordinary star-atlas, so that east and west are interchanged, and the globe has to be rotated the wrong way. Stars of the first five magnitudes are shown. The millennial precessional path of the pole corresponds, on a 6-inch globe, to about 7 mm., so that it was easy to drill « polar » holes corresponding to intervals of time showing appreciable precessional changes on the celestial globe. The support of the polar axis had to be modified in order to permit the variation and measurement of the altitude of the pole.

Tomb of SENMUT (XVIIIth dynasty). Third chamber. NE corner.

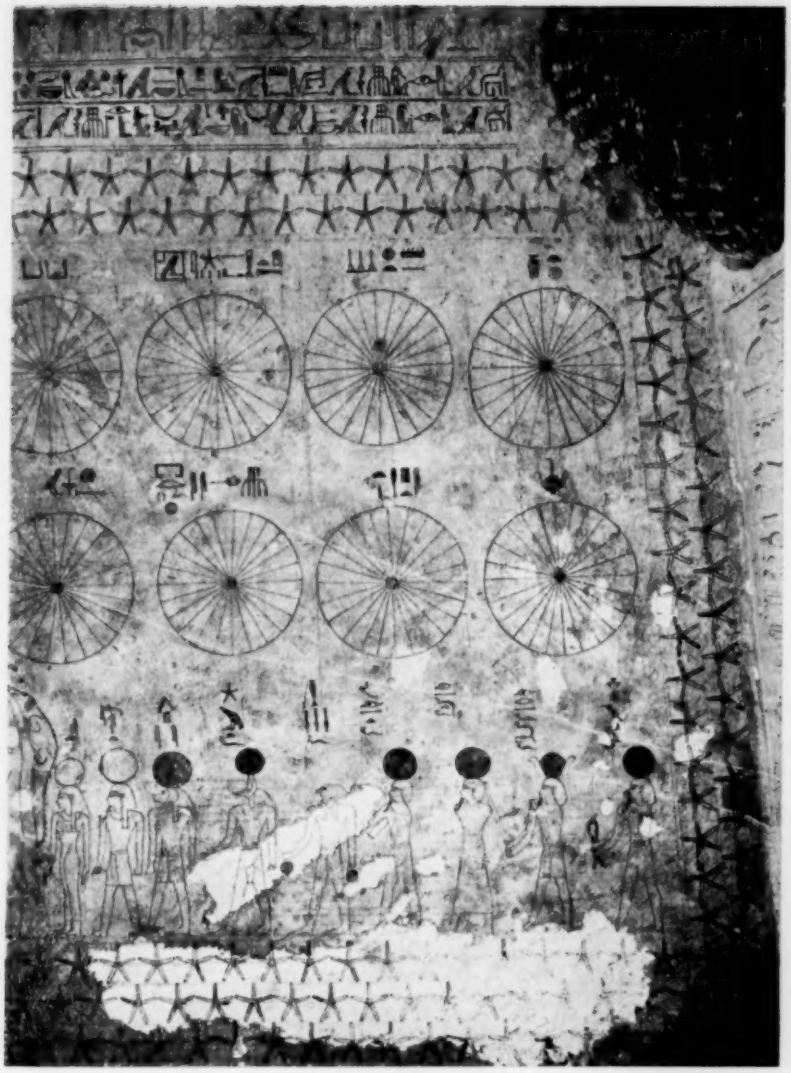
A. POGO (pl. A).

SENMUT ceiling. Above : southern panel. Below : northern panel.
East is on the right

SENMUT ceiling. Central strip. Eastern part.

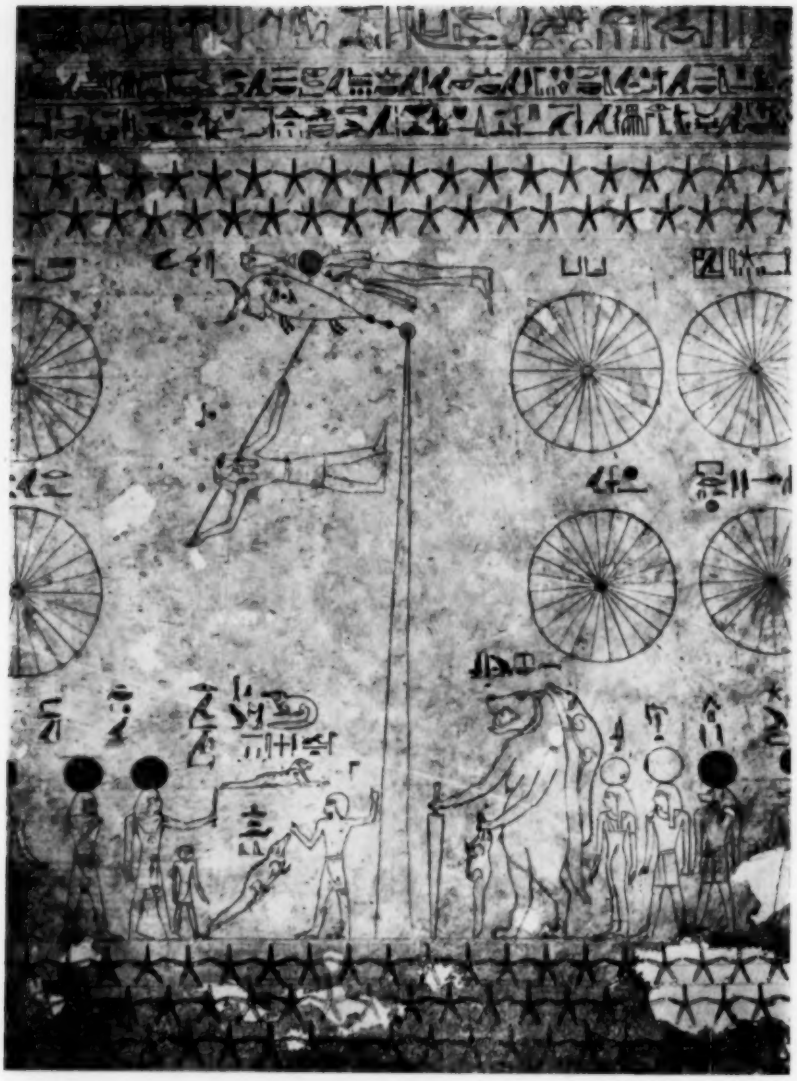


SENMUT ceiling. Central strip. Western part.

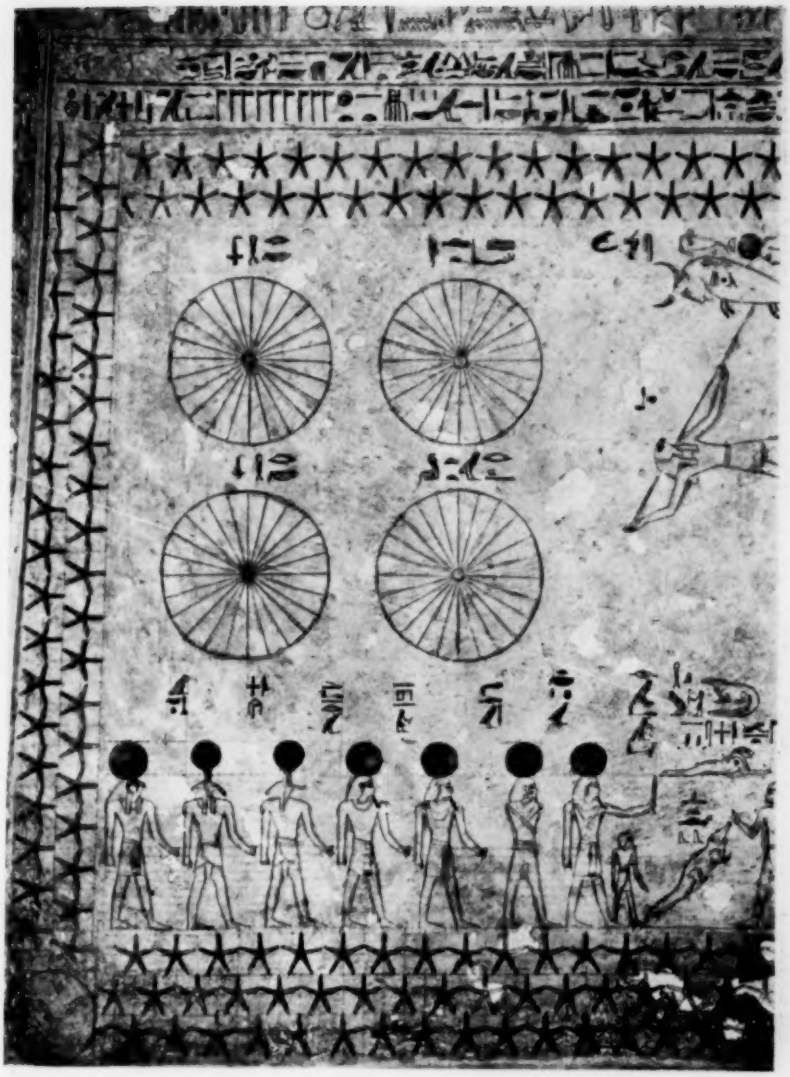


SENMUT ceiling. Northern panel. Eastern part.

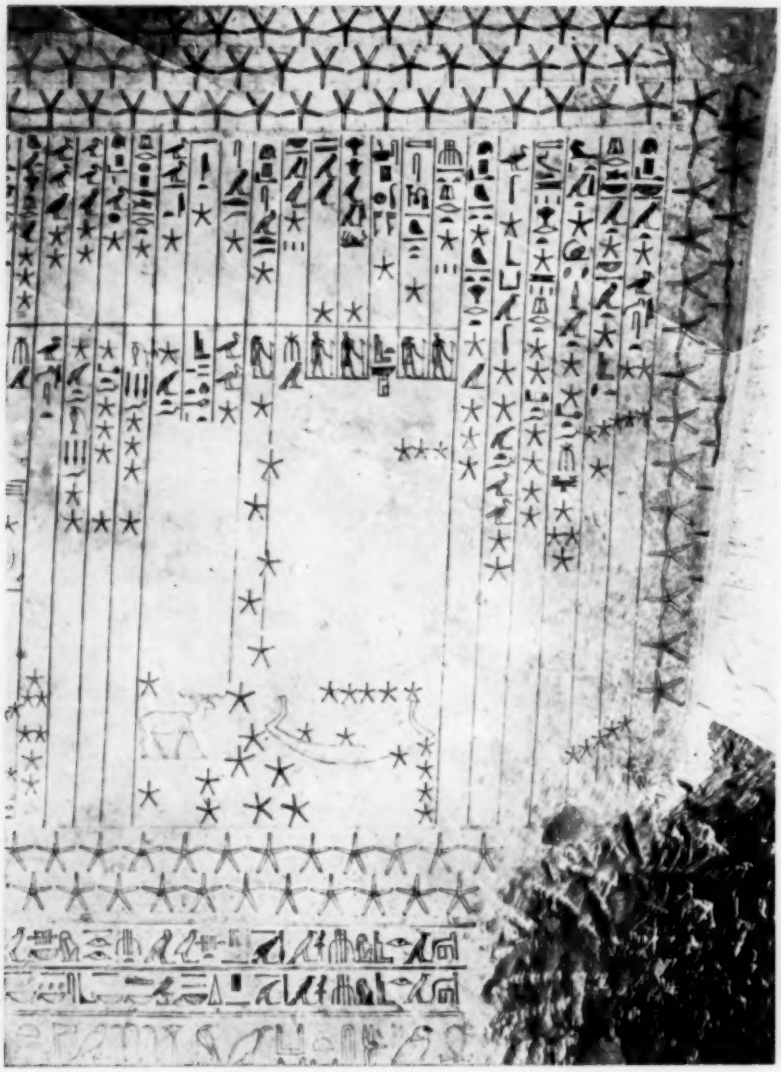
SENMUT ceiling. Central strip. Western part.



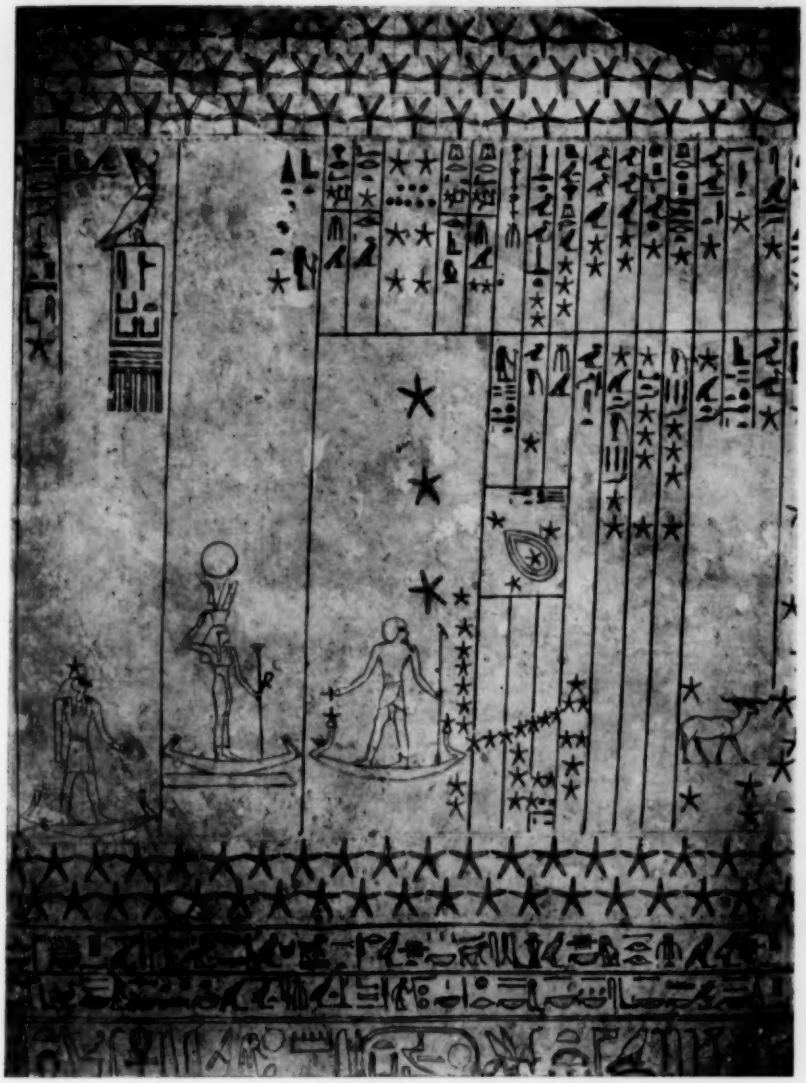
SENMUT ceiling. Northern panel. Central part.



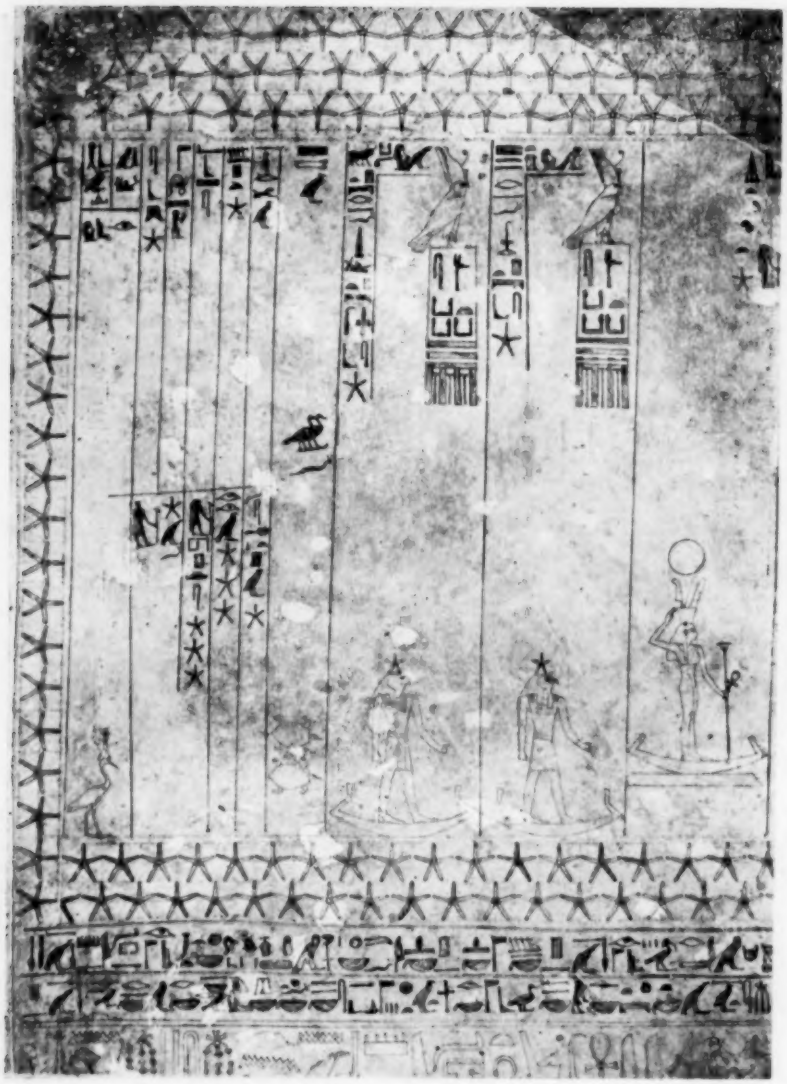
SENMUT ceiling. Northern panel. Western part.



SENMUT ceiling. Southern panel. Eastern part.



SENMUT ceiling. Southern panel. Central part.



SENMUT ceiling. Southern panel. Western part.

independently followed the same prototypes; the comparison of their work shows how traditions still understood in the middle of the second millennium gradually lost their meaning and became mere conventions for the craftsmen of the XIXth dynasty. Of course, there were traditions which were already obscure to the draftsman of SENMUT.

The bull MESKHETI is the well-known Egyptian representation of the constellation Ursa Major. When the draftsman of SENMUT

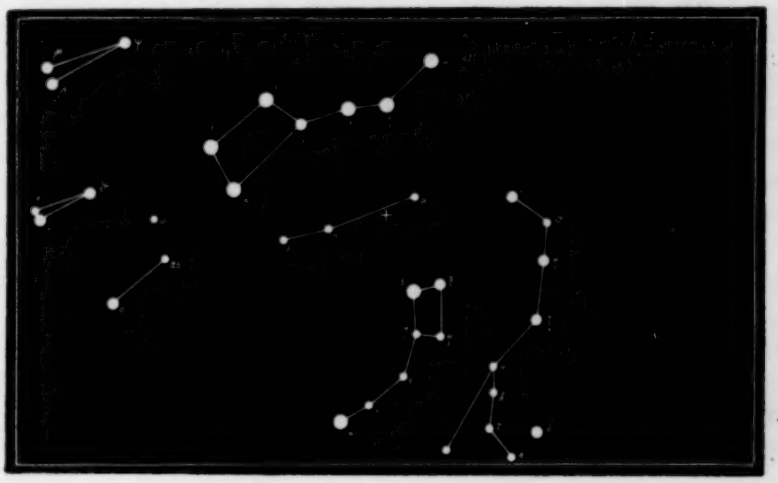


Fig. 4. Sketch of the northern circumpolar constellations. Horizon of Thebes. About 2000 B. C. The approximate position of the pole is indicated by a cross.

attached two pairs of rudimentary legs to the ovoid « body » of the bull, it did not occur to him that the ovoid appendix to the bull's head originally represented one of his legs (corresponding, probably, to the stars in the handle of the Dipper). The three stars attached to the bull of the Senmut ceiling correspond to the position of Delta, Epsilon, and Zeta Ursae Majoris. Around 3000 B. C., Zeta was the only 2nd magnitude star within ten degrees of the pole; the upper culmination of Eta Ursae Majoris coincided, for the latitude of Thebes, with the setting of Sirius.

Observations of culminations of circumpolar stars for the determination of the meridian were certainly made by Egyptians when Eta and then Zeta Ursae Majoris were the nearest of the

bright circumpolar stars. The transit staff (21) in Berlin is of relatively recent date, but the plumb-line holder which apparently belongs to it looks like a distant descendant of the cross-shadow ruler (22) which bears the name of THUTMOSE III; other paraphernalia of the cord-stretching ceremony of SENMUT's age exist in Cairo, or are represented on monuments (23).

The traditional speech and response accompanying the ceremony of the stretching of the cord are thus rendered by BRUGSCH (24): « Ich habe gefasst den Pflock sammt dem Griffe des Schlägels, ich nehme den Messstrick in Gemeinschaft mit der Göttin SAFEKH-ABUI, ich betrachte die vorwärts schreitende Bewegung der Gestirne. Mein Auge haftet am Grossen Bären (25). Ich zähle die Zeit ab, prüfend die Uhr (26) und stelle fest die Ecken deines Gotteshauses. — Ich habe ergriffen den Pflock, ich fasse den Griff des Schlägels, ich nehme den Messstrick in Gemeinschaft mit der Göttin SAFEKH-ABUI, ich richte mein Gesicht auf den Lauf der Gestirne, ich lasse eintreten mein Auge in das Sternbild des Grossen Bären (28). Es steht da der Zeiger der Zeit neben

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(21) LUDWIG BORCHARDT, Ein altägyptisches astronomisches Instrument. *Zeitschrift f. Aeg. Sprache*, vol. 37, p. 10-17, with 3 figs., 1899.

(22) LUDWIG BORCHARDT, Altägyptische Sonnenuhren. *Zeitschrift f. Aeg. Sprache*, vol. 48, p. 917, with 2 pl., 1911.

(23) A colored representation of the cord-stretching equipment used by THUTMOSE III in the restoration of a temple of the XIIth dynasty is described in BRUGSCH, *Thesaurus*, p. 1279.

(24) BRUGSCH, *Thesaurus*, p. 85.

(25) Ursa Minor, according to BORCHARDT's translation, *Ztschr. f. Aeg. Spr.*, vol. 37, p. 13. In the Ptolemaic period, Ursa Minor was possibly substituted for Ursa Major—in the observations, not in the traditional texts. A list of such texts is given by BORCHARDT, p. 12, note.

(26) BORCHARDT's translation, loc. cit., « Der... steht neben (?) senem Zeiger ». In observing upper culminations of Zeta Ursae Majoris, astronomers of the beginning of the second millennium might have noticed that they occurred at various hours of the night, but always—within the lifetime of many generations—with the conspicuous companion to the right of the bright star; the right-angle handle of the plumb-line made the determination of a horizontal line easy. The « time-measuring » passage of the traditional formula for the ceremony of the stretching of the cord possibly refers to the position of Alcor; the texts translated by BRUGSCH and by BORCHARDT show the plumb-line hieroglyph; if the Egyptians were interested in the location, on their horizon, of the plumb-line through the pole, there is no reason why they should have attempted to determine the hour of the culmination.

(28) See note 25, above.

seiner Uhr (29). Ich stelle fest die Ecken deines Gotteshauses. »

The star surrounded by a circle on the SENMUT ceiling corresponds, obviously, to the easily recognizable bright star, Zeta Ursae Majoris—the one with the conspicuous companion. The scorpion goddess SELQET stands behind the bull MESKHETI in such a way that it seems as if she were trying to grasp the two cords stretched from the culminating star Zeta—over the invisible pole—down to the northern horizon. As Pl. A clearly shows, the east-and-west orientation of the axis of the slightly vaulted sepulchral hall implies that the meridian is comprised between the two cords.

By 1500 B. C., the celestial pole was closer to Ursa Minor than to Ursa Major; culminations of Beta Ursae Minoris could be—and possibly were—used for the determination of the meridian. It is therefore not surprising that craftsmen of the XIXth dynasty began to consider the meridian cords as mere reins attached to the tail of the bull; see Fig. 5 in *Isis*, VII, Pl. 7.

The hippopotamus with the crocodile on her back probably corresponds to the stars in Draco indicated in our sketch (Fig. 4). One of the hands of the hippopotamus rests on the « dipper » of Ursa Minor, which is just east of the meridian with our Polaris near the horizon of Thebes. The hand of the hippopotamus always rests, in later representations, on an object which is wider at the top than at the bottom; the reins always lead to that support of the hippopotamus in more or less fancy curves,—a tradition blindly followed by craftsmen who could not be expected to realize that in the dim past a vertical line joined Zeta or even Eta Ursae Majoris, when they culminated, with Ursa Minor near the horizon.

The identification of the circumpolar constellations of Pl. F which appear west of the meridian, near the horizon, is rather difficult. The stars Omicron and 23 Ursae Majoris may have something to do with the crocodile, and the stars Lambda-Kappa-Alpha Draconis, with the man facing the crocodile (his left hand, his head, and his right hand, respectively).

On later representations, the shifting of the scorpion goddess westward and closer to the horizon might be connected with the

(29) See note 26, preceding page.

position and shape of the two groups of stars, Lambda-Mu-Psi and Iota-Kappa-Theta Ursae Majoris. Again, it is possible that these two triangular groups of stars are connected with the little crocodile (with a curved tail) which is variously represented in the neighborhood of the scorpion or of the crocodile-tailed lion —in the case of the SENMUT ceiling, for the first time, simultaneously in both places. It should be noticed that the crocodile-tailed lion of the SENMUT ceiling appears on an erased spot, his name having been shifted closer to the little crocodile.

The much-studied circumpolar groups of the XIXth-dynasty and of later monuments ought to be compared, by astronomers and by Egyptologists, with the SENMUT group. The interpretation of the names of some of the animals may help to locate them in the sky.

3. *The unfinished monthly star-tables.* (Plates E and G).

The circumpolar constellations divide the 12 circles corresponding to the 12 months in three groups: the months of the Inundation in the right upper row, the months of the Winter to the left, and the months of the Summer in the right lower row. The succession of the names—borrowed from the corresponding feasts—goes from right to left in the upper row, and from left to right in the lower, i.e., counter-clockwise, like the apparent rotation of the circumpolar stars.

The circles subdivided into 24 sectors are a new feature of an astronomical ceiling; the connection with the subdivision of the day into 24 hours is obvious. LUDWIG BORCHARDT gave the already mentioned description, with photographs and diagrams, of an instrument which permits measuring the six hours between sunrise and noon, or between noon and sunset, and which happens to be of the same age as the SENMUT ceiling—the name of THUTMOSE III appears on it. Mural, vertical sundials existed in the Middle Kingdom. GUENTHER ROEDER assumes that the subdivided circles of the SENMUT ceiling were intended as a kind of astronomical tables or monthly star-charts indicating the stars which culminated, in hourly intervals, between sunset and sunrise, on the first od each month. The problem is complicated by the wandering of the feasts through the seasons within the Sothic cycle.

Whether the unfinished monthly circular tables on the SENMUT

ceiling represent an ambitious attempt to introduce a new feature in the decoration of sepulchral halls or a hesitating attempt to continue a dying tradition, only future finds could show. Completed monthly star-tables of this kind can be useful for the Egyptologist as information concerning the date of the tomb; but they must have been of limited assistance to the departed: even if he intended to use his « permanent » calendar again after the lapse of a Sothic cycle, the precession of the equinoxes would have rendered the set of circular tables hopelessly obsolete.

Incidentally, Pl. E and G show that the draftsman inscribed his circles in squares, the diagonals coinciding—as a rule but not without exceptions—with the corresponding subdivisions; part of the blame should go to the slight curvature of the ceiling.

4. *The centripetal groups of divinities.* (Plates E and G).

The divinities associated with the decans will be listed later. The two groups of figures represented on the northern panel, on both sides of the circumpolar constellations, contain, in addition to the divinities listed in the catalogue of the decans, other mythological beings illustrative of Egyptian astrology and chronology rather than astronomy. A comparison of the three ceilings—SENMUT, SETI I, and the Ramesseum—shows that the number and the order of these two centripetal groups was subject to slight variations.

The eastern groups, composed of nine figures on all three ceilings, seems to reflect a more persistent tradition than the western group. On the ceilings of SENMUT (Pl. E) and of SETI I (*Isis*, VII, Pl. 7, Fig. 6), the goddess ISIS precedes the anthropomorphic AMSET, the pavian-headed HAPI, the jackal-headed DUAMUTEF, and the hawk-headed QEBHSENUF. On the Ramesseum ceiling, the four guardians of the dead immediately follow the hippopotamus. The absence of color in the discs carried by ISIS and AMSET, on the SENMUT ceiling, may be due to the unfinished state of the tomb, but it is more probable that there is some mythological reason for it. A peculiarity of the SENMUT group of the four guardians is the absence of a disc on the hawk-head of QEBHSENUF, who holds instead two little discs in his hands. The remaining figures of the eastern group of the SENMUT ceiling are essentially the same as the corresponding divinities of the well-known monuments of the XIXth dynasty: MAAENTEF,

whose arms vary in length and position on the three ceilings, and were apparently the cause of the erasure in the case of the Ramesseum; ANTCHERF, who is always armless; ARRENFTCHESEF, whose disc is not decorated with feathers (30) in the case of the Ramesseum; finally HAUQ (31), who holds an « h » or an *ankh* in his hands. A discussion of the connection between these divinities and the hours of the day and of the night, and the days of the month must be left to students of Egyptian chronology.

The western group, composed of seven *discophoroi* on the SENMUT ceiling (Pl. G), and of eleven figures on the two monuments of the XIXth dynasty, reveals a less rigid compliance with tradition. The little anonymous figure of the SENMUT ceiling does not appear on later monuments; it is not impossible that it forms a link between the *rhabdophoros* and the group of northern constellations, just like ISIS links the eastern group with her ponderous allomorphic apparition. None of the seven disc-bearing divinities of the western SENMUT group is mentioned in the mythological part of the catalogue of the decans. They are essentially the same as the first seven divinities of the western group of SETI I and of the Ramesseum (32). The armless TEKNU of SENMUT appears with crossed arms on the SETI ceiling; apparently, the left arm of THEKNU, in the Ramesseum, was not bent at the elbow, like the right one, which may account for the erasure. The last two figures of the western SENMUT group still remind us of the association of SET with HORUS; in the monuments of the XIXth dynasty, the head of the evil one, with long, square-cut ears, and a proboscis, is replaced by the ibis-head of THOT. The SET-HORUS group of SENMUT forms an appropriate link with the panel of the southern constellations and the list of the decans. The THOT-HORUS group of the XIXth-dynasty monuments is followed by four additional figures which do not seem to be connected with the summer solstice. The eleventh divinity of the western group of the

(30) On the Ramesseum ceiling, MAAT seems to have the exclusive privilege of bearing feathers.

(31) HAUQ is defined, in BUDGE's *Dictionary* (p. 462), as « the god of the ninth day of the month ». His is the ninth figure of the eastern group on the ceilings of SENMUT and SETI I.

(32) As in the eastern group, the SENMUT andromorphic divinities are usually bearded, while the corresponding figures of the two ceilings of the XIXth dynasty are shaven.

Ramesseum is RAMESES II himself. The eleventh figure on the ceiling of SETI I, mislabeled DUAMUTEF, is probably a repetition of the seventh divinity, HORUS HEKNU, and not an introduction of QEBHSENUF; the guardian of the dead would be isolated without his companions, whereas a tradition of having a HORUS-figure at the end of the western group as a transition to the southern panel is suggested by the SENMUT monument.

The confusion of names on the ceiling of SETI I is due—partly, at least,—to the fact that eight divinities are crowded together under the first seven names; the name of the first additional figure immediately follows the group of seven names; a gap in the list of names is followed by the correct identification of the second and third additional divinities and concluded by the already mentioned mislabelling of the hawk-headed HORUS-figure; the Ramesseum inscriptions help put order in this confusion. The systematic allotment of space to the figures and their names on the SENMUT ceiling, as shown by the auxiliary lines on Pl. G, is a noteworthy contrast to the crowding of divinities and names on the SETI monument.

5. *Orion and Sirius.* (Plate J).

The northern panel of the SENMUT ceiling consists, as we have seen, of three parts: the central group of circumpolar constellations, the Inundation and Summer months surmounting the eastern group of centripetal divinities, and the Winter months surmounting the western disc-bearers. The southern panel of the SENMUT ceiling can be considered, in a similar way, as consisting of three parts. In the center is the Orion-Sirius group characteristic of the southern sky. As stated before, the orientation of the southern panel is such that the person in the tomb looking at it has to lift his head and face north, not south. The list of the decans preceding the SAH-SEPDET group occupies, therefore, the eastern part of the southern panel, whereas the planets and the constellations which follow SEPDET in the traditional arrangement are listed in the western part. The southern strip of the Ramesseum, like the southern panel of SENMUT, must be read, in the temple, by a person facing north. On the ceiling of SETI I, on the other hand, the orientation of the southern panel is astronomically correct, so that Orion precedes Sirius in the westward motion of the southern sky.

The irrational orientation of the southern panel has caused some confusion in the representation of SAH on the ceilings of SENMUT and of the Ramesseum, both of which obviously follow the same tradition. On the ceiling of SETI I—which reflects another tradition—OSIRIS-SAH, participating in the nightly westward motion of the sky, is running away from ISIS-SEPDET; he turns his head back eastward to look at the pursuing goddess; the bow of her boat is almost ramming the stern of his. With the reversed orientation of the southern panel, Orion, the most conspicuous constellation of the southern sky, appeared to be moving eastward, i.e., in the wrong direction; to save the situation, Orion was turned around—within or with his boat. The SENMUT and the Ramesseum ceilings represent Orion in this « reversed » position, adapted to their orientation of the southern panel; the SENMUT draftsman made the bows and sterns (33) look alike; in the Ramesseum, the bow of Orion's boat approaches the bow of the boat of the Sirius-goddess; the element of pursuit is lost in both cases; instead of looking back at the bright star behind him, the god is turning his head away from the goddess. Mythologically, both the SENMUT-Ramesseum and the SETI traditions may be equally valuable; astronomically, the SETI representation is far more satisfactory.

6. *The catalogue of the decans.* (Plates H and J).

The decanologue of the SETI ceiling (*Isis*, VII, Pl. 7, Figs. 8 and 9) consists of 23 columns. The upper rectangle of each column gives the name of a decan or the names of a group of decans. The middle rectangle contains a number of stars which corresponds, as a rule, to the number of decans named above it. The lower rectangle names and pictures the divinities associated with the decan or decans at the top of the column; of course, errors due to overcrowding are present.

The decanologue of the SENMUT ceiling consists of 29 columns. Here too, an astronomical upper part of the columns should be distinguished from an astrological or mythological lower part; a clear separation of the two by an east-and-west line across the catalogue begins, however, in the seventh column only. The determinative stars of the decans (corresponding to the stars in

(33) He originally curved the stern of the elevated boat of ISIS-SEPDET.

the middle rectangles of the SETI decanologue) immediately follow the names of the decans. The names of the associated divinities are followed by stars arranged in such a way as to represent

Table I. — LIST of DECANS (XVIIIth and XIXth Dynasties)

NUMBER	DECAN	NUMBER	DECAN
1	Ṭepā-kenmut	23a	Ṭepā-khu
2	Kenmut	23b	Khukhu
3	Kher-khept-kenmut	24	Baba
4	Ḥā-tchat	25	Khent-ḥeru
5	Peḥui-tchat	26	Ḥer-âb-khentu
6	Themat-ḥert	27	Khent-kheru
7	Themat-khert	28	Qeṭ
8	Usthâ	29	Sasa-qeṭ
9	Bekathâ	30	Ārt
10	Ṭepā-khentet	31	Khau
11	Khentet-ḥert	32a	Remen-saḥ
12	Khentet-khert	32b	Remen-ḥeru-an-saḥ
13	Themes-en-khentet	33	Mestcher-saḥ
14	Sapt-khennu	34	Remen-kher-saḥ
15	Ḥer-ab-uâa	35	A-Saḥ
16	Shesmu	36a	Saḥ
17	Kenmu		
18	Ṭepā-semṭ		★ ★ ... .
19	Semṭet	36b	★ ★
20	Sert		
21	Sasa-sert		★ ★
22	Kher-khept-sert	37	Sepṭet

the constellations to which the decans above them belong. To the constellations represented in the columns 7-12 (the Boat), 14-16 (the Ram), 21-23 (the « Egg »), and 24-28 (Orion), could be added the slanting row of five stars running twice across the

columns 1 and 2, the rhomb in column 3, the zigzag between the columns 12 and 13, the star-cluster at the bottom of columns

Table II. Synopsis of the Decanologues of Senmut, Seti I and of the Ramesseum.

SENMUT			SETI I			RAMESSEUM		
COL.	DECAN	DIVINITIES	COL.	DECAN	DIVINITIES	COL.	DECAN	DIVINITIES
1	1	Ha, Am	1	1	Seb	1	1	Ha, Am
2	3 2	Is	2	2	Ba	2	3 2	Is
			3	3	Kh			
3	4 5	Du, CH	4	4	Is	3	4 5	Du, CH
			5	5	LD			
4	6 7	Du	6	6	Am, Ha	4	6 7	Du
			7	7	Qe			
5	8 9	Du, Ha	8	8	Du	5	8 9	Du, Ha
			9	9	Du, Qe			
6	10 21	Ho	10	10	Du, Ha	6	10 11	Ho
7	12	Set	11	11 12 13	Ho Set Ho	7	12	—
8	13	Ho				8	13	—
9	14	Is, Ne	12	14 15 16	Is, Ne Set Ho	9	14	Is, Ne
10	15	Set				10	15	Ur
11	16	Set				11	16	Ur?
12	17	CH	13	17	Am, Ha, Du, Qe	12	17	CH
13	18	Ho	14	19 18	Ha Ho	13	—	—
14	19	Ha				14	19	Ha
15	20	Is	15	20	Is	15	20	Is
16	21	Du	16	21	Du, Qe	16	21	Du
17	22	Qe	17	22	Qe	17	22	Qe
18	23a	Du	18	23b	Du, Qe	18	23a	Du
19	23b	Du, Qe				19	23b	Du, Qe
20	24	Ha, Am	19	24	Am, Ha	20	24	Ha, Am
21	27?	CH	20	25 26 27 28	Ho	21	25? 27?	CH
22	28 29	Ha, Qe?	21	29	Am,Ha;Qe,Du;Qe,Ha	22	28 29	Ha, Ur?
23	31	Ho	22	30 31	Am, Ha; Du, Qe	23	30	EH
24	34	CH				24	34	CH
25	34	Os		32b 33 34 35	Ho, MH	25	36b	—
26	36b	—				26	32a	EH
27	30	EH				27	32b	CH
28	32b	CH		36a	MH, Os			
29	37	Is	23	37	Is	28	37	Is

20-22, the V-shaped group between Orion and the « Egg », the conspicuous, almost vertical (34), row of Delta-Epsilon-Zeta Orionis, and—in the list of the decans, not among the associated divinities,—the schematic representation (35) of the principal decan of the SAH-region.

Table I gives a list of the decans mentioned in the decanologues of SENMUT, of SETI I, and of the Ramesseum.

Table III. DIVINITIES associated with the DECANS on the three ceilings.

Design.	DIVINITY	DECANS		
		SENMUT	SETI I	RAMESSEUM
Am	Àmset	1, 24	6, 17, 24, 29, 30, 31	1, 24
Ha	Ḥāpi	1, 8-9, 19, 24, 28-29	6, 10, 17, 19, 24, 29, 30, 31	1, 8-9, 19, 24, 28-29
Du	Duamutef	4-5, 6-7, 8-9, 21, 23a, 23b	8, 9, 10, 17, 21, 23b, 29, 30, 31	4-5, 6-7, 8-9 21, 23a, 23b
Qe	Qebḥsenuf	22, 23b, 28-29?	7, 9, 17, 21, 22, 23b, 29, 30, 31	22, 23b
CH	Child(ren) of Horus	4-5, 17, 27?, 32b, 34	.....	4-5, 17, 25? 27? 32b, 34
Os	Osiris	34	36a	.....
Ho	Horus	10-11, 13, 18, 31	11, 13, 16, 18, 25-28, 32b-35	10-11
EH	Eye of Horus	30	.....	30, 32a
MH	Maat-Horus	.....	32b-36a	....
Set	Set	12, 15, 16	12, 15	.....
Is	Isis	2-3, 14, 20, 37	4, 14, 20, 37	2-3, 14, 20, 37
Ne	Nephthys	14	14	14
Seb	Seb	.....	1	.....
Ba	Ba	.....	2	.....
Ur	Ur	.....	.....	15, 16? 28-29?
Kh	Khentet-khast	.....	3	.....
LD	Lady of Depahet	.....	5	.....

(34) An astronomically correct representation of the « belt » of Orion on the eastern horizon of Thebes in the second millennium B.C.

(35) To the modern eye the resemblance to Orion is but slight. The SENMUT draftsman certainly enjoyed the symmetrical arrangement of the hieroglyphs of the SAH-decans. The decorative value of the SETI arrangement, in a mounting scale leading up to SAH, is also worth noticing. Did the craftsmen omit, repeat, and rearrange the decans of the SAH-region for aesthetical reasons?

Table II shows at a glance the order and the grouping of the decans on the three ceilings and the divinities associated with each (36) decan.

Table III gives a list of the associated divinities and shows the groups of decans assigned to each (37) divinity on the three ceilings.

Even without a careful study of the Tables II and III the reader will notice the difference between the SENMUT-Ramesseum and the SETI decanologues: the selection, order, and grouping of the decans, and their association with different sets of divinities clearly show the existence of two traditions.

The possibility (38) of a change in the order of two consecutive decans because of the precession of the equinoxes can be easily demonstrated. Let us consider the two bright stars, Alpha Pavonis and Alpha Aquilae. In the fourth millennium, the southern star appeared on the horizon of Thebes before Altair. About 3000 B. C., they rose almost simultaneously. By the end of the third millennium, Altair was above the eastern horizon of Thebes at the time of the rising of Alpha Pavonis in the south-east. It is worth noticing that in the third millenium Altair rose about twelve hours after Sirius, in the latitude of Thebes (39); its heliacal rising fell, therefore, in the 19th decad (ten-day week) after the heliacal rising of Sirius: the 19th decan of the original catalogue could have been Altair. This statement should not be construed as an identification of SEMTET or of TEPA-SEMT

(36) When the decans or the associated divinities appear in groups on the monuments, it is not always possible to avoid a certain degree of uncertainty in the assignment of the divinities to the decans—as is amply proved by later decanologues.

(37) See preceding note.

(38) Procyon (*προκύων*), the " predecessor " of Sirius (*κύων*), could be quoted as a classical example of the obsolescence, due to precession, of a name indicating the order of rising. When CLAUDIUS PTOLEMY lived, Procyon still rose before Sirius even in upper Egypt; Sirius now precedes Procyon, on the eastern horizon, even in latitudes slightly higher than that of Alexandria. It should be noted, in this connection, that Sirius culminates before Procyon since the fourth millennium B.C.; and that, north of the equator, the setting of Sirius has always preceded the setting of Procyon, just as the rising of Sirius has always preceded, in southern latitudes, the rising of Procyon.

(39) A. ROMIEU in his « Lettre à M. LEPSIUS sur un décan du ciel égyptien » (*Ztschr. f. Aeg. Sprache*, vol. 6, p. 136-146, 1868) gives long computations leading to the same results concerning Altair as those obtained by the simple rotation of our 6-inch globe, after the polar axis has been adjusted for the epoch and for the latitude.

(head of S., beginning of S., precursor of S.) with Altair; no conclusions as to the antiquity of the decanologues of SENMUT and of SETI I should be based on the order of the names of these two decans as long as the stars or groups of stars corresponding to both of them have not been identified without ambiguity.

Although our 6-inch celestial globe has permitted us to identify, tentatively, several decans with certain conspicuous stars or groups of stars (40), which appeared in ten-day intervals on the horizon of Thebes about 3000 B. C. and about 1500 B. C., a check of the results in a ZEISS planetarium seems to be desirable.

The hieroglyphs containing the word « khet », and appearing, e.g., above the « Egg », at the bottom of column 21, and below the HORUS of column 23 on the SENMUT ceiling, have been interpreted by H. BRUGSCH (41) as meaning « accumulation of stars », « star-cluster ». A glance at Fig. 3 will show that the « Egg » has the shape of a loop of stars on the SETI ceiling. The V-shaped group of stars, between Orion and the « Egg », reappears in the shape of a V on the SETI ceiling. Our 6-inch globe shows that about 3000 B. C., when the vernal equinox was in Taurus and the celestial equator passed through the Pleiades, the heliacal rising of the Pleiades and of the Hyades occurred almost exactly east of Thebes and was followed—two decads after Aldebaran or four decads after the Pleiades, and practically in the same part of the horizon—by the heliacal rising of Betelgeuze. With these explanations in mind, it will not be difficult to see on the ceilings of SENMUT and SETI I a fairly correct (42) representation of the Pleiades and the Hyades, preceding Orion and Sirius. The general confusion which characterizes, in all decanologues, the Orion region—so rich in stars and star-lore—frustrates all attempts of a closer identification of the individual decans.

A few remarks concerning the divinities associated with the decans. The astronomical value of these divinities is very limited;

(40) The constellation of the Ship (decans 12-17), e.g., seems to overlap with our Scorpio; the KENMU stars of decan 17 seem to belong to the Milky Way in Sagittarius, etc.

(41) BRUGSCH, *Thesaurus*, p. 160-161.

(42) Especially on the SETI ceiling. The number of stars in the Pleiades and the Hyades varies within reasonable limits on the different monuments of the Empire. Good imagination rather than good eyes characterized the Egyptian star-gazers.

Table III shows clearly that they do not correspond to « regions » of the sky or super-constellations. For the Egyptologists, their importance lies in the possibility of determining the antiquity of the traditions. Thus, the divinities, SEB, BA, KHENTET-KHAST, and the LADY OF DEPAHET (Aphroditopolis) are found on the SETI ceiling only; on the other hand, the « Children of Horus » are not mentioned on it, although the four guardians prominently figure singly or in groups, even with repetition (decan 29). On the Ramesseum ceiling, UR replaces the infernal SET who is still associated with decan 12 on the earlier monument of the XIXth dynasty; erasures in columns 13 and 21 of the Ramesseum prove that the decans 18 and 25 or 27, still acceptable to the draftsman of SENMUT, have caused trouble a quarter of a millennium later; OSIRIS is not mentioned in the Ramesseum in connection with Orion.

7. *The planets and the meta-Sothic constellations.* (Plate K).

The left half of the southern panel of the SENMUT ceiling contains a list of planets and constellations occupying the traditional place after SEPDET.

The now damaged part of the ceiling of SETI I used to offer many important features; it is therefore desirable to compare Fig. 3 with Pl. K and with Fig. 2a.

Jupiter, the wandering star of the south, is the first planet after Sirius on the three ceilings. The associated divinity is HORUS, in a boat, with a star on his head.

Saturn, the next planet, is a western wandering star on the SETI ceiling; this « bull of the heaven » is wandering in the east on the ceilings of SENMUT and of the Ramesseum. The associated divinity is HORUS, in a boat, with a star on his head.

Mars is the next planet on the ceilings of SETI and of the Ramesseum. In both cases, he is in retrograde (44) motion; he is an eastern star on the SETI ceiling, a western star in the Ramesseum. Mars is not mentioned on the SENMUT ceiling; apparently, he was in conjunction with the Sun, when the decoration

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(43) The « Children of HORUS »—and not a HORUS—were probably associated with decan 34 of the SETI tradition.

(44) The erasure in the Ramesseum suggests that the motion of Mars ceased to be retrograde while the ceiling decoration was going on.

was going on. The associated divinity is HORUS, in a boat, with a star on his head (45).

It is probable that Mars was in conjunction with the Sun, and that Saturn was an eastern evening-star, when SENMUT's draftsman was at work; that Saturn was in the west, and Mars in the east, at sunset, when the inscriptions were added to the figures on the SETI ceiling; and that Saturn was an eastern and Mars a western evening-star, when the Ramesseum craftsmen were at work on the planetary part of the ceiling. The laconism of the Jupiter rectangle of SETI I, and the erasure (46) in the Ramesseum of the reference to the south might be due to conjunctions with the Sun or to the embarrasing appearance of Jupiter as an eastern or western evening-star, when the craftsmen of the two astrographic monuments of the XIXth dynasty were dating their masterpieces. The coöperation of an Egyptologist with an astronomer might solve these and several other interesting problems.

The constellation of the (two) Tortoises, SHETHU, follows Saturn on the SENMUT ceiling and Mars in the Ramesseum; on the SETI monument an empty rectangle intervenes between Mars and SHETHU. Was the draftsman of SETI I tempted to add DUAMUTEF to HAPI and AMSET, and to forget that they are followed by HORUS —and not by QEBHSENUF? Is the empty rectangle a reminder of an obscure and obsolete decan whose associated divinity was DUAMUTEF; who followed SEPDET, when she headed the original decanologue; and who joined her later, when the flagship of ISIS appeared in the rear? It should be kept in mind that the constellation of the Tortoise appears, in temples of the Graeco-Roman period, as the leading decan, a successor of TEPA-KENMUT who heads the decanologues of the Empire. Does the empty rectangle of the SETI ceiling, the cenotaph of an unknown decan preceded by SEPDET, the former leader, and followed by SHETHU, the future leader, reflect several millennia of precession—from the dawn to the twilight of Egyptian astronomy?—The divinity

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(45) On the SENMUT ceiling there is a difference in the coloring of such details as stars, crowns, scepters, etc., common both to the Jupiter and to the Saturn columns.

(46) Incomplete; BRUGSCH has been able to read part of the erased text (*Thesaurus*, p. 65, 68).

associated with SHETHU, on the SETI ceiling, is HAPI; on the SENMUT monument, DUAMUTEF's « f »-snail crept in—to remind us of the discarded decan—and the resulting group, which is neither HAPI nor DUAMUTEF, should not be dismissed as a simple error of writing; in the Ramesseum, the embarrassment of choice led to the omission of the name of the divinity associated with SHETHU.

The two constellations which follow, NESRU and SHEPET, are the same on the three ceilings. The divinity associated with NESRU on the SETI ceiling (47) is AMSET; the opinion of BRUGSCH (48) that the name SEKHET-PET associated, on the Ramesseum ceiling, with NESRU is connected with SEBSHES, appears in a new light after the discovery of the SENMUT ceiling. The two eyes of HORUS are associated with SHEPET on the SENMUT ceiling, and three stars appear below the hawk; in the Ramesseum, the three stars still are below the HORUS, but the two eyes are omitted; on the SETI monument, the eyes (or their equivalent) are far above the hawk and five stars appear above the hawk-head of HORUS; the constellation SHEPET probably consisted of five stars.

The next constellation is called APESET on the SETI ceiling; the associated divinity is a HORUS with two superposed stars. The constellation is called ABSHES on the ceilings of SENMUT and of the Ramesseum; the associated divinity (49) is HORUS HEPDES. The constellation SEBSHES of the SETI monument is not mentioned on the ceilings of SENMUT and of the Ramesseum; the associated divinity is a HORUS with two juxtaposed stars. The two constellations, APESET and SEBSHES, named on the SETI ceiling, rose to the rank of Graeco-Roman decans, when SIBUMAHU, the successor of our BEKATHA (decan 9), retired from active service.

The following constellation, UASHNETER, appears on the ceilings of SENMUT and of SETI I, and is missing on that of the Ramesseum; the associated divinity is DUAMUTEF. The Ramesseum has, instead of UASHNETER, the name of ANEP (50); the associated divinity is still DUAMUTEF.

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(47) The elevated position of the names of AMSET and the four associated divinities which follow, must have some mythological reason.

(48) BRUGSCH, *Thesaurus*, p. 115, 116.

(49) See BRUGSCH, *Thesaurus*, p. 115, 116.

(50) See BRUGSCH, *Thesaurus*, p. 115, for the dating of the Ramesseum by this reference to the 20th day of the month of the Moon.

The planet Mercury comes next on the three ceilings. The associated divinity, on the SENMUT monument, is SET. As could be expected, this devilish divinity is replaced in the Ramesseum by a HORUS, although a reminder of SET is apparently preserved in the scepter-head attached to the name of the planet. On the SETI ceiling, the name of SET appears over the juxtaposed stars of the slant-eared divinity associated with the planet.

The planet Venus occupies its traditional position at the end of the list; the associated divinity is always OSIRIS, symbolized by the phoenix BENNU. It is interesting to note that the draftsman of SENMUT extended the erasure of the line beyond the level of the associated divinities of the neighboring columns, so as to place the name of OSIRIS high above the phoenix, just below the name of the wandering star; the traditions reflected on the ceilings of SENMUT and SETI I seem to agree on the proper places for the names of the planet and of its divinity, and for the image of graceful BENNU.

(Harvard Library, 189. *Cambridge, Mass)*. A. POGO.

Discovery of the dispersion of light and of the nature of color (1672)

With facsimile reproduction (nº. X) of NEWTON'S *New theory about light and colors (Philosophical Transactions, nº. 80, February 19, 1672, p. 3075-87).*

N. B. Brief list of previous facsimiles indicating the vol. of *Isis*, wherein they appeared.

I. DE MOIVRE, 1738. Vol. 8.
II. PASCAL, 1640. Vol. 10.
III-IV. OERSTED, 1820. Vol. 10.
V. MAYER, 1842. Vol. 13.
VI. JOULE, 1843. Vol. 13.
VII. SADI CARNOT, 1824-32. Vol. 13
VIII. DARWIN, 1859. Vol. 14.
IX. WALLACE, 1859. Vol. 14.

The following paper which NEWTON published in 1672, and wherein he discussed experiments which he had begun in 1666 and pursued with some long interruptions until 1671, may be considered one of the great classics of scientific method. The author was only twenty-four when he began these experiments and not yet thirty when he published them, yet they bore unmistakably the mark of his genius.

It contained the experimental proof that ordinary light is essentially heterogeneous and consists of a quantity of rays of different refrangibilities. Further it established a one-to-one correspondence between refrangibility and color, the least refrangible rays being red and the most refrangible violet, and it showed that the refrangibility or color was not affected by further reflections or refractions. New colors were obtained by mixtures of different rays — compound colors as opposed to the original colors of the rays — and finally the primitive white color was reproduced by a mixture of all the colors of the spectrum. NEWTON explained not only these fundamental facts, but also many consequences or applications. If lenses dispersed light, the power of telescopes and microscopes was probably limited, unless refrac-

tors were replaced by reflectors. The odd phaenomena of an infusion of *lignum nephriticum*, (1) transmitting one color and reflecting another, was accounted for, the colors of the rainbow were justified, finally the natural colors of all bodies.

In some of these discoveries NEWTON had been anticipated by others. MAUROLYCUS and DESCARTES had already compared the colors of the rainbow with those produced artificially by means of a prism. JOHN MARCUS MARCI (1595-1667) in his *Thaumantias liber de arcu cœlesti deque colorum apparentium natura ortu et causis* (Prague, 1648) had outlined the Newtonian theory of colors. (2) FRANCESCO MAUROLYCO (1494-1575) had already suspected the heterogeneity of white light (*Photismi de lumine et umbra*, Naples, 1611) but MARCUS MARCI had actually proved it, and he had shown that monochromatic rays did not change their color, by the same « experimentum crucis » as NEWTON's. FRANCESCO MARIA GRIMALDI (1618-63) in his *Physico-mathesis de lumine, coloribus, et iride, aliisque annexis* (Bologna, 1665) had offered ingenious but obscure speculations on the cause of the colors, suggesting that they were due to different undulations. In this he was a forerunner not only of NEWTON but of HUYGENS. However, NEWTON was the first to clinch the whole theory of color by accomplishing not only the analysis of white light but also its synthesis.

We may assume that NEWTON knew the Cartesian views, but there is no reason to believe that he had any but the most superficial acquaintance with those of MARCUS MARCI and GRIMALDI. At any rate he does not mention them, and from all that we know of his character, he would certainly have done so if he had been familiar with them. That he had made some readings on the subject is proved by his reference to « Optick Authors » on p. 3079, and he names his colleague ROBERT HOOKE on p. 3084. GRIMALDI's treatise *Physico-mathesis de lumine* had been imperfectly reviewed by HENRY OLDENBURG in the *Philosophical transactions* for Jan. 22, 1672 - that is just before NEWTON wrote his own paper. Whether he had read OLDENBURG's review, or not, is uncertain, but at any rate, that was mostly irrelevant to his

(1) On this see WILLIAM E. SAFFORD, 1916, 1918 (*Isis*, 3, 106).
(2) E. HOPPE, 1927 (*Isis*, 11, 185).

own experiments. (3) The book itself had not yet been seen by him in 1675, and probably not even in 1704, when he elaborated his theory of light and color in the *Opticks : or a Treatise on the reflexions, refractions, inflexions, and colours of light* (London, 1704).

As to MARCUS MARCI of Kronland, it is very unlikely that NEWTON read his *Thaumantias*. That book published in Prague was not very well known even on the continent. Besides it was the kind of book which would have discouraged a reader as critical as NEWTON, because of the mixture of prophetic truth with error. This helps us to realize the astounding quality of NEWTON's paper; its value does not lie only in the true results which it sets forth, but in the experimental method which it illustrates so remarkably well, and in its general soundness. If one were to apprize scientific works by giving positive marks for the truths, and negative marks for the errors, the total value of MARCI's work would be relatively low, that of NEWTON's paper of 1672 very high.

But the best proof that the ideas explained in that paper of 1672 were really novel, and even revolutionary, is given by the strange reception accorded to them. It seems difficult to believe that experiments so clearly described and discussed should have been the cause of such controversies. Indeed these experiments were so simple that they could be easily repeated with a minimum of apparatus. Yet they were misunderstood by a number of contemporaries, IGNACE GASTON PARDIES, FRANCIS HALL (LINUS) and ANTOINE LUCAS (all of these Jesuits), and even HUYGENS. For an excellent account of these controversies, which disgusted and almost discouraged the future author of the *Principia*, see L. ROSENFELD : La théorie des couleurs de NEWTON et ses adversaires (*Isis*, 9, 44-65, 1927).

The following facsimile is published thanks to the courtesy of the Library of Congress and of Mr. F. E. BRASCH.

November, 1, 1929. GEORGE SARTON.

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(3) For example, we read in it (p. 3069) « GRIMALDI explains also, How Light by the sole intrinsick modification of itself, passeth sometimes into a colour that is commonly called *Apparent* : Where he declareth, that the reason, why Light passeth into an Apparent colour, is not some determinate Angle, at which the rays amongst themselves are inclined; but that that Colour is produced by the intension and density of Light. » etc. How different that language and thought from NEWTON's ! It is clear that the latter had little if anything to learn from the former.

PHILOSOPHICAL TRANSACTIONS.

February 19. $16\frac{71}{72}$.

The CONTENTS.

A Letter of Mr. Iſaac Newton, *Mathematick Profeſſor in the Univerſity of Cambridge; containing his New Theory about* Light *and* Colors: *Where* Light *is declared to be not Similar or Homogeneal, but conſiſting of difform rays, ſome of which are more refrangible than others: And* Colors *are affirm'd to be not Qualifications of Light, deriv'd from Refractions of natural Bodies, (as 'tis generally believed;) but Original and Connate properties, which in divers rays are divers: Where ſeveral Obſervations and Experiments are alledged to prove the ſaid Theory. An Accompt of ſome Books:* I. *A Deſcription of the* EAST-INDIAN COASTS, MALABAR, CORÒMANDEL, CEYLON, *&c. in* Dutch, *by* Phil. Baldæus. II. Antonii le Grand *INSTITUTIO PHILOSOPHIÆ, ſecundùm principia* Renati Des-Cartes; *novâ methodo adornata & explicata.* III. *An Eſſay to the Advancement of MUSICK; by* Thomas Salmon *M. A. Advertiſement about* Thæon Smyrnæus. *An* Index *for the Tracts of the Year* 1671.

A Letter of Mr. Iſaac Newton, *Profeſſor of the Mathematicks in the Univerſity of Cambridge; containing his New Theory about* Light *and* Colors: *ſent by the Author to the Publiſher from Cambridge, Febr.* 6. $16\frac{71}{72}$; *in order to be communicated to the* R. Society.

SIR,

TO perform my late promiſe to you, I ſhall without further ceremony acquaint you, that in the beginning of the Year 1666 (at which time I applyed my ſelf to the grinding of Optick glaſſes of other figures than *Spherical,*) I procured me a Triangular glaſs-Priſme, to try therewith the celebrated *Phænomena* of

Colours. And in order thereto having darkened my chamber, and made a ſmall hole in my window-ſhuts, to let in a convenient quantity of the Suns light, I placed my Priſme at his entrance, that it might be thereby refracted to the oppoſite wall. It was at firſt a very pleaſing divertiſement, to view the vivid and intenſe colours produced thereby; but after a while applying my ſelf to conſider them more circumſpectly, I became ſurpriſed to ſee them in an *oblong* form; which, according to the received laws of Refraction, I expected ſhould have been *circular*.

They were terminated at the ſides with ſtreight lines, but at the ends, the decay of light was ſo gradual, that it was difficult to determine juſtly, what was their figure; yet they ſeemed *ſemicircular*.

Comparing the length of this coloured *Spectrum* with its breadth, I found it about five times greater; a diſproportion ſo extravagant, that it excited me to a more then ordinary curioſity of examining, from whence it might proceed. I could ſcarce think, that the various *Thickneſs* of the glaſs, or the termination with ſhadow or darkneſs, could have any Influence on light to produce ſuch an effect; yet I thought it not amiſs, firſt to examine thoſe circumſtances, and ſo tryed, what would happen by tranſmitting light through parts of the glaſs of divers thickneſſes, or through holes in the window of divers bigneſſes, or by ſetting the Priſme without ſo, that the light might paſs through it, and be refracted before it was terminated by the hole: But I found none of thoſe circumſtances material. The faſhion of the colours was in all theſe caſes the ſame.

Then I ſuſpected, whether by any *unevenneſs* in the glaſs, or other contingent irregularity, theſe colours might be thus dilated. And to try this, I took another Priſme like the former, and ſo placed it, that the light, paſſing through them both, might be refracted contrary ways, and ſo by the latter returned into that courſe, from which the former had diverted it. For, by this means I thought, the *regular* effects of the firſt Priſme would be deſtroyed by the ſecond Priſme, but the *irregular* ones more augmented, by the multiplicity of refractions. The event was, that the light, which by the firſt Priſme was diffuſed into an *oblong* form, was by the ſecond reduced into an *orbicular* one with as much regularity, as when it did not at all paſs through them. So that, what ever was the cauſe of that length, 'twas not any contingent irregularity.

I then proceeded to examin more critically, what might be effected by the difference of the incidence of Rays coming from divers parts of the Sun; and to that end, meaſured the ſeveral lines and angles, belonging to the Image. Its diſtance from the hole or Priſme was 22 foot; its utmoſt length 13½ inches; its breadth 2½; the diameter of the hole ⅛ of an inch; the angle, with the Rays, tending towards the middle of the image, made with thoſe lines, in which they would have proceeded without refraction, was 44.deg.56'. And the vertical Angle of the Priſme, 63 deg. 12'. Alſo the Refractions on both ſides the Priſme, that is, of the Incident, and Emergent Rays, were as near, as I could make them, equal, and conſequently about 54 deg. 4'. And the Rays fell perpendicularly upon the wall. Now ſubducting the diameter of the hole from the length and breadth of the Image, there remains 13 Inches the length, and 2⅜ the breadth, comprehended by thoſe Rays, which paſſed through the center of the ſaid hole, and conſequently the angle of the hole, which that breadth ſubtended, was about 31', anſwerable to the Suns Diameter; but the angle, which its length ſubtended, was more then five ſuch diameters, namely 2 deg. 49'.

Having made theſe obſervations, I firſt computed from them the refractive power of that glaſs, and found it meaſured by the *ratio* of the ſines, 20 to 31. And then, by that *ratio*, I computed the Refractions of two Rays flowing from oppoſite parts of the Sun's *diſous*, ſo as to differ 31' in their obliquity of Incidence, and found, that the emergent Rays ſhould have comprehended an angle of about 31', as they did, before they were incident.

But becauſe this computation was founded on the Hypotheſis of the proportionality of the *ſines* of Incidence, and Refraction, which though by my own Experience I could not imagine to be ſo erroneous, as to make that Angle but 31', which in reality was 2 deg. 49'; yet my curioſity cauſed me again to take my Priſme. And having placed it at my window, as before, I obſerved, that by turning it a little about its *axis* to and fro, ſo as to vary its obliquity to the light, more then an angle of 4 or 5 degrees, the Colours were not thereby ſenſibly tranſlated from their place on the wall, and conſequently by that variation of Incidence, the quantity of Refraction was not ſenſibly varied. By this Experiment therefore, as well as by the former computation, it was evident, that the difference of the Incidence of Rays, flowing from divers

parts of the Sun, could not make them after decuſſation diverge at a ſenſibly greater angle, than that at which they before converged; which being, at moſt, but about 31 or 32 minutes, there ſtill remained ſome other cauſe to be found out, from whence it could be 2 degr. 49'.

Then I began to ſuſpect, whether the Rays, after their trajection through the Priſme, did not move in curve lines, and according to their more or leſs cutvity tend to divers parts of the wall. And it increaſed my ſuſpition, when I remembred that I had often ſeen a Tennis ball, ſtruck with an oblique Racket, deſcribe ſuch a curve line. For, a circular as well as a progreſſive motion being communicated to it by that ſtroak, its parts on that ſide, where the motions conſpire, muſt preſs and beat the contiguous Air more violently than on the other, and there excite a reluctancy and reaction of the Air proportionably greater. And for the ſame reaſon, if the Rays of light ſhould poſſibly be globular bodies, and by their oblique paſſage out of one medium into another acquire a circulating motion, they ought to feel the greater reſiſtance from the ambient Æther, on that ſide, where the motions conſpire, and thence be continually bowed to the other. But notwithſtanding this plauſible ground of ſuſpition, when I came to examine it, I could obſerve no ſuch curvity in them. And beſides (which was enough for my purpoſe) I obſerved, that the difference 'twixt the length of the Image, and diameter of the hole, through which the light was tranſmitted, was proportionable to their diſtance.

The gradual removal of theſe ſuſpitions, at length led me to the *Experimentum Crucis*, which was this: I took two boards, and placed one of them cloſe behind the Priſme at the window, ſo that the light might paſs through a ſmall hole, made in it for the purpoſe, and fall on the other board, which I placed at about 12 feet diſtance, having firſt made a ſmall hole in it alſo, for ſome of that Incident light to paſs through. Then I placed another Priſme behind this ſecond board, ſo that the light, trajected through both the boards, might paſs through that alſo, and be again refracted before it arrived at the wall. This done, I took the firſt Priſme in my hand, and turned it to and fro ſlowly about its *Axis*, ſo much as to make the ſeveral parts of the Image, caſt on the ſecond board, ſucceſſively paſs through the hole in it, that I might obſerve to what places on the wall the ſecond Priſme would refract them.

And

And I ſaw by the variation of thoſe places, that the light, tending to that end of the Image, towards which the refraction of the firſt Priſme was made, did in the ſecond Priſme ſuffer a Refraction conſiderably greater then the light tending to the other end. And ſo the true cauſe of the length of that Image was detected to be no other, then that *Light* conſiſts of *Rays differently refrangible*, which, without any reſpect to a difference in their incidence, were, according to their degrees of refrangibility, tranſmitted towards divers parts of the wall.

When I underſtood this, I left off my aforeſaid Glaſs works; for I ſaw, that the perfection of Teleſcopes was hitherto limited, not ſo much for want of glaſſes truly figured according to the preſcriptions of Optick Authors, (which all men have hitherto imagined,) as becauſe that Light it ſelf is a *Heterogeneous mixture of differently refrangible Rays*. So that, were a glaſs ſo exactly figured, as to collect any one ſort of rays into one point, it could not collect thoſe alſo into the ſame point, which having the ſame Incidence upon the ſame Medium are apt to ſuffer a different refraction. Nay, I wondered, that ſeeing the difference of refrangibility was ſo great, as I found it, Teleſcopes ſhould arrive to that perfection they are now at. For, meaſuring the refractions in one of my Priſmes, I found, that ſuppoſing the common *ſine* of Incidence upon one of its planes was 44 parts, the *ſine* of refraction of the utmoſt Rays on the red end of the Colours, made out of the glaſs into the Air, would be 68 parts, and the *ſine* of refraction of the utmoſt rays on the other end, 69 parts: So that the difference is about a 24*th* or 25*th* part of the whole refraction. And conſequently, the object-glaſs of any Teleſcope cannot collect all the rays, which come from one point of an object ſo as to make them convene at its *focus* in leſs room then in a circular ſpace, whoſe diameter is the 50*th* part of the Diameter of its Aperture; which is an irregularity, ſome hundreds of times greater, then a circularly figured *Lens*, of ſo ſmall a ſection as the Object glaſſes of long Teleſcopes are, would cauſe by the unfitneſs of its figure, were Light *uniform*.

This made me take *Reflections* into conſideration, and finding them regular, ſo that the Angle of Reflection of all ſorts of Rays was equal to their Angle of Incidence; I underſtood, that by their mediation Optick inſtruments might be brought to any degree of perfection imaginable, provided a *Reflecting* ſubſtance could be found,

ſound, which would poliſh as finely as Glaſs, and *reflect* as much light, as glaſs *tranſmits*, and the art of communicating to it a *Parabolick* figure be alſo attained. But there ſeemed very great difficulties, and I have almoſt thought them inſuperable, when I further conſidered, that every irregularity in a reflecting ſuperficies makes the rays ſtray 5 or 6 times more out of their due courſe, than the like irregularities in a refracting one: So that a much greater curioſity would be here requiſite, than in figuring glaſſes for Refraction.

Amidſt theſe thoughts I was forced from *Cambridge* by the Intervening Plague, and it was more then two years, before I proceeded further. But then having thought on a tender way of poliſhing, proper for metall, whereby, as I imagined, the figure alſo would be corrected to the laſt; I began to try, what might be effected in this kind, and by degrees ſo far perfected an Inſtrument (in the eſſential parts of it like that I ſent to *London*,) by which I could diſcern Jupiters 4 Concomitants, and ſhewed them divers times to two others of my acquaintance. I could alſo diſcern the Moon-like phaſe of *Venus*, but not very diſtinctly, nor without ſome niceneſs in diſpoſing the Inſtrument.

From that time I was interrupted till this laſt Autumn, when I made the other. And as that was ſenſibly better then the firſt (eſpecially for Day-Objects,) ſo I doubt not, but they will be ſtill brought to a much greater perfection by their endeavours, who, as you inform me, are taking care about it at *London*.

I have ſometimes thought to make a *Microſcope*, which in like manner ſhould have, inſtead of an Object-glaſs, a Reflecting piece of metall. And this I hope they will alſo take into conſideration. For thoſe Inſtruments ſeem as capable of improvement as *Teleſcopes*, and perhaps more, becauſe but one reflective piece of metall is requiſite in them, as you may perceive by the annexed diagram, where A B repreſenteth the object metall, C D the eye glaſs, F their common Focus, and O the other focus of the metall, in which the object is placed.

But

But to return from this digreſſion, I told you, that Light is not ſimilar, or homogeneal, but conſiſts of *difform* Rays, ſome of which are more refrangible than others: So that of thoſe, which are alike incident on the ſame medium, ſome ſhall be more refracted than others, and that not by any virtue of the glaſs, or other external cauſe, but from a predispoſition, which every particular Ray hath to ſuffer a particular degree of Refraction.

I ſhall now proceed to acquaint you with another more notable difformity in its Rays, wherein the *Origin of Colours* is unfolded: Concerning which I ſhall lay down the *Doctrine* firſt, and then, for its examination, give you an inſtance or two of the *Experiments*, as a ſpecimen of the reſt.

The Doctrine you will find comprehended and illuſtrated in the following propoſitions.

1. As the Rays of light differ in degrees of Refrangibility, ſo they alſo differ in their diſpoſition to exhibit this or that particular colour. Colours are not *Qualifications of Light*, derived from Refractions, or Reflections of natural Bodies (as 'tis generally believed,) but *Original* and *connate properties*, which in divers Rays are divers. Some Rays are diſpoſed to exhibit a red colour and no other; ſome a yellow and no other, ſome a green and no other, and ſo of the reſt. Nor are there only Rays proper and particular to the more eminent colours, but even to all their intermediate gradations.

2. To the ſame degree of Refrangibility ever belongs the ſame colour, and to the ſame colour ever belongs the ſame degree of Refrangibility. The *leaſt Refrangible* Rays are all diſpoſed to exhibit a *Red* colour, and contrarily thoſe Rays, which are diſpoſed to exhibit a *Red* colour, are all the leaſt refrangible: So the *moſt refrangible* Rays are all diſpoſed to exhibit a deep *Violet-Colour*, and contrarily thoſe which are apt to exhibit ſuch a violet colour, are all the moſt Refrangible. And ſo to all the intermediate colours in a continued ſeries belong intermediate degrees of refrang bility. And this Analogy 'twixt colours, and refrangibility, is very preciſe and ſtrict; the Rays always either exactly agreeing in both, or proportionally diſagreeing in both.

3. The ſpecies of colour, and degree of Refrangibility proper to any particular ſort of Rays, is not mutable by Refraction, ner by Reflection from natural bodies, nor by any other cauſe, that I could yet obſerve. When any one ſort of Rays hath been well parted

parted from thoſe of other kinds, it hath afterwards obſtinately retained its colour, notwithſtanding my utmoſt endeavours to change it. I have refracted it with Priſmes, and reflected it with Bodies, which in Day-light were of other colours; I have intercepted it with the coloured film of Air interceding two compreſſed plates of glaſs; tranſmitted it through coloured Mediums, and through Mediums irradiated with other ſorts of Rays, and diverſly terminated it; and yet could never produce any new colour out of it. It would by contracting or dilating become more brisk, or faint, and by the loſs of many Rays, in ſome caſes very obſcure and dark; but I could never ſee it changed *in ſpecie*.

Yet ſeeming tranſmutations of Colours may be made, where there is any mixture of divers ſorts of Rays. For in ſuch mixtures, the component colours appear not, but, by their mutual allaying each other, conſtitute a midling colour. And therefore, if by refraction, or any other of the aforeſaid cauſes, the difform Rays, latent in ſuch a mixture, be ſeparated, there ſhall emerge colours different from the colour of the compoſition. Which colours are not New generated, but only made Apparent by being parted; for if they be again intirely mix't and blended together, they will again compoſe that colour, which they did before ſeparation. And for the ſame reaſon, Tranſmutations made by the convening of divers colours are not real; for when the difform Rays are again ſevered, they will exhibit the very ſame colours, which they did before they entered the compoſition: as you ſee, *Blew* and *Yellow* powders, when finely mixed, appear to the naked eye *Green*, and yet the Colours of the Component corpuſcles are not thereby really tranſmuted, but only blended. For, when viewed with a good Microſcope, they ſtill appear *Blew* and *Yellow* interſperſedly.

5. There are therefore two ſorts of Colours. The one original and ſimple, the other compounded of theſe. The Original or primary colours are, *Red*, *Yellow*, *Green*, *Blew*, and a *Violet-purple*, together with Orange, Indico, and an indefinite variety of Intermediate gradations.

6. The ſame colours in *Specie* with theſe Primary ones may be alſo produced by compoſition: For, a mixture of *Yellow* and *Blew* makes *Green*; of *Red* and *Yellow* makes *Orange*; of *Orange* and *Yellowiſh green* makes *yellow*. And in general, if any two Colours be mixed, which in the ſeries of thoſe, generated by the Priſme, are

not

not too far diſtant one from another, they by their mutual alloy compound that colour, which in the ſaid ſeries appeareth in the mid-way between them. But thoſe, which are ſituated at too great a diſtance, do not ſo. *Orange* and *Indico* produce not the intermediate Green, nor Scarlet and Green the intermediate yellow.

7. But the moſt ſurpriſing and wonderful compoſition was that of *Whiteneſs*. There is no one ſort of Rays which alone can exhibit this. 'Tis ever compounded, and to its compoſition are requiſite all the aforeſaid primary Colours, mixed in a due proportion. I have often with Admiration beheld, that all the Colours of the Priſme being made to converge, and thereby to be again mixed as they were in the light before it was Incident upon the Priſme, reproduced light, intirely and perfectly white, and not at all ſenſibly differing from a *direct* Light of the Sun, unleſs when the glaſſes, I uſed, were not ſufficiently clear; for then they would a little incline it to *their* colour.

8 Hence therefore it comes to paſs, that *Whiteneſs* is the uſual colour of *Light*; for, Light is a confuſed aggregate of Rays indued with all ſorts of Colors, as they are promiſcuouſly darted from the various parts of luminous bodies. And of ſuch a confuſed aggregate, as I ſaid, is generated Whiteneſs, if there be a due proportion of the Ingredients; but if any one predominate, the Light muſt incline to that colour; as it happens in the Blew flame of Brimſtone; the yellow flame of a Candle; and the various colours of the Fixed ſtars.

9. Theſe things conſidered, the *manner*, how colours are produced by the Priſme, is evident. For, of the Rays, conſtituting the incident light, ſince thoſe which differ in Colour proportionally differ in Refrangibility, *they* by their unequall refractions muſt be ſevered and diſperſed into an oblong form in an orderly ſucceſſion from the leaſt refracted Scarlet to the moſt refracted Violet. And for the ſame reaſon it is, that objects, when looked upon through a Priſme, appear coloured. For, the difform Rays, by their unequal Refractions, are made to diverge towards ſeveral parts of the *Retina*, and there expreſs the Images of things coloured, as in the former caſe they did the Suns Image upon a wall. And by this inequality of refractions they become not only coloured, but alſo very confuſed and indiſtinct

10. Why the Colours of the *Rainbow* appear in falling drops

of Rain, is alſo from hence evident. For, thoſe drops, which refract the Rays, diſpoſed to appear purple, in greateſt quantity to the Spectators eye, refract the Rays of other ſorts ſo much leſs, as to make them paſs beſide it; and ſuch are the drops on the inſide of the *Primary* Bow, and on the outſide of the *Secondary* or Exteriour one. So thoſe drops, which refract in greateſt plenty the Rays, apt to appear red, toward the Spectators eye, refract thoſe of other ſorts ſo much more, as to make them paſs beſide it; and ſuch are the drops on the exteriour part of the *Primary*, and interiour part of the *Secondary* Bow.

11. The odd Phænomena of an infuſion of *Lignum Nephriticum*, *Leaf gold*, *Fragments of coloured glaſs*, and ſome other tranſparently coloured bodies, appearing in one poſition of one colour, and of another in another, are on theſe grounds no longer riddles. For, thoſe are ſubſtances apt to reflect one ſort of light and tranſmit another; as may be ſeen in a dark room, by illuminating them with ſimilar or uncompounded light. For, then they appear of that colour only, with which they are illuminated, but yet in one poſition more vivid and luminous than in another, accordingly as they are diſpoſed more or leſs to reflect or tranſmit the incident colour.

12. From hence alſo is manifeſt the reaſon of an unexpected Experiment, which Mr. *Hook* ſomewhere in his *Micrography* relates to have made with two wedg-like tranſparent veſſels, fill'd the one with a red, the other with a blew liquor: namely, that though they were ſeverally tranſparent enough, yet both together became opake; For, if one tranſmitted only red, and the other only blew, no rays could paſs through both.

13. I might add more inſtances of this nature, but I ſhall conclude with this general one, that the Colours of all natural Bodies have no other origin than this, that they are variouſly qualified to reflect one ſort of light in greater plenty then another. And this I have experimented in a dark Room by illuminating thoſe bodies with uncompounded light of divers colours. For by that means any body may be made to appear of any colour. They have there no appropriate colour, but ever appear of the colour of the light caſt upon them, but yet with this difference, that they are moſt brisk and vivid in the light of their own day-light-colour. *Minium* appeareth there of any colour indifferently, with which 'tis illuſtrated, but yet moſt luminous in red, and ſo

Biſe appeareth indifferently of any colour with which 'tis illuſtrated, but yet moſt luminous in blew. And therefore *Minium* reflecteth Rays of any colour, but moſt copiouſly thoſe indued with red; and conſequently when illuſtrated with day-light, that is, with all ſorts of Roys promiſcuouſly blended, thoſe qualified with red ſhall abound moſt in the reflected light, and by their prevalence cauſe it to appear of that colour. And for the ſame reaſon *Biſe*, reflecting blew moſt copiouſly, ſhall appear blew by the exceſs of thoſe Rays in its reflected light; and the like of other bodies. And that this is the intire and adequate cauſe of their colours, is manifeſt, becauſe they have no power to change or alter the colours of any ſort of Rays incident apart, but put on all colours indifferently, with which they are inlightned.

Theſe things being ſo, it can be no longer diſputed, whether there be colours in the dark, nor whether they be the qualities of the objects we ſee, no nor perhaps, whether Light be a Body. For, ſince Colours are the *qualities* of Light, having its Rays for their intire and immediate ſubject, how can we think thoſe Rays *qualities* alſo, unleſs one quality may be the ſubject of and ſuſtain another; which in effect is to call it *Subſtance*. We ſhould not know Bodies for ſubſtances, were it not for their ſenſible qualities, and the Principal of thoſe being now found due to ſomething elſe, we have as good reaſon to believe that to be a Subſtance alſo.

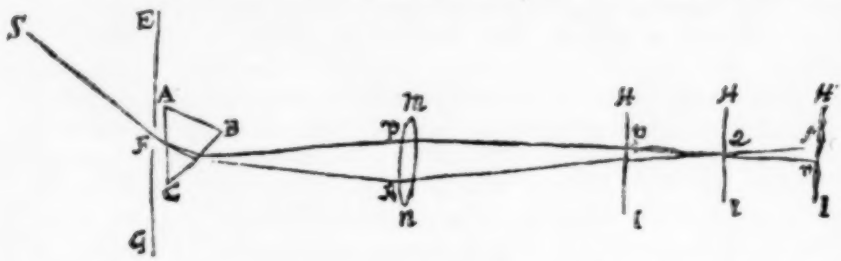
Beſides, whoever thought any quality to be a *heterogeneous* aggregate, ſuch as Light is diſcovered to be. But, to determine more abſolutely, what Light is, after what manner refracted, and by what modes or actions it produceth in our minds the Phantaſms of Colours, is not ſo eaſie. And I ſhall not mingle conjectures with certainties.

Reviewing what I have written, I ſee the diſcourſe it ſelf will lead to divers Experiments ſufficient for its examination: And therefore I ſhall not trouble you further, than to deſcribe one of thoſe, which I have already inſinuated.

In a darkened Room make a hole in the ſhut of a window, whoſe diameter may conveniently be about a third part of an inch, to admit a convenient quantity of the Suns light: And there place a clear and colourleſs Priſme, to refract the entring light towards the further part of the Room, which, as I ſaid, will thereby be diffuſed into an oblong coloured Image. Then place a *Lens* of

about three foot radius (ſuppoſe a broad Object-glaſs of a three foot Teleſcope,) at the diſtance of about four or five foot from thence, through which all thoſe colours may at once be tranſmitted, and made by its Refraction to convene at a further diſtance of about ten or twelve feet. If at that diſtance you intercept this light with a ſheet of white paper, you will ſee the colours converted into whiteneſs again by being mingled. But it is requiſite, that the *Priſme* and *Lens* be placed ſteddy, and that the paper, on which the colours are caſt, be moved to and fro; for, by ſuch motion, you will not only find, at what diſtance the whiteneſs is moſt perfect but alſo ſee, how the colours gradually convene, and vaniſh into whiteneſs, and afterwards having croſſed one another in that place where they compound Whiteneſs, are again diſſipated, and ſevered, and in an inverted order retain the ſame colours, which they had before they entered the compoſition. You may alſo ſee, that, if any of the Colours at the *Lens* be intercepted, the Whiteneſs will be changed into the other colours. And therefore, that the compoſition of whiteneſs be perfect, care muſt be taken, that none of the colours fall beſides the *Lens*.

In the annexed deſign of this Experiment, A B C expreſſeth the Priſm ſet endwiſe to ſight, cloſe by the hole F of the window



E G. Its vertical Angle A C B may conveniently be about 60 degrees: *MN* deſigneth the *Lens*. Its breadth 2½ or 3 inches. S F one of the ſtreight lines, in which difform Rays may be conceived to flow ſucceſſively from the Sun. F P, and F R two of thoſe Rays unequally refracted, which the *Lens* makes to converge towards Q, and after decuſſation to diverge again. And H I the paper, at divers diſtances, on which the colours are projected: which in Q conſtitute *Whiteneſs*, but are *Red* and *Yellow* in R, r, and *r*, and *Blew* and *Purple* in P, p, and *π*.

If

If you proceed further to try the impoſſibility of changing any uncompounded colour (which I have aſſerted in the third and thirteenth Propoſitions,) 'tis requiſite that the Room be made very dark, leaſt any ſcattering light, mixing with the colour, diſturb and allay it, and render it compound, contrary to the deſign of the Experiment. 'Tis alſo requiſite, that there be a perfecter ſeparation of the Colours, than, after the manner above deſcribed, can be made by the Refraction of one ſingle Priſme, and how to make ſuch further ſeparations, will ſcarce be difficult to them, that conſider the diſcovered laws of Refractions. But if tryal ſhall be made with colours not throughly ſeparated, there muſt be allowed changes proportionable to the mixture. Thus if compound Yellow light fall upon Blew *Biſe*, the Biſe will not appear perfectly yellow, but rather green, becauſe there are in the yellow mixture many rays indued with green, and Green being leſs remote from the uſual blew colour of Biſe than yellow, is the more copiouſly reflected by it.

In like manner, if any one of the Priſmatick colours, ſuppoſe Red, be intercepted, on deſign to try the aſſerted impoſſibility of reproducing that Colour out of the others which are pretermitted; 'tis neceſſary, either that the colours be very well parted before the red be intercepted, or that together with the red the neighbouring colours, into which any red is ſecretly diſperſed, (that is, the yellow, and perhaps green too) be intercepted, or elſe, that allowance be made for the emerging of ſo much red out of the yellow green, as may poſſibly have been diffuſed, and ſcatteringly blended in thoſe colours. And if theſe things be obſerved, the new Production of Red, or any intercepted colour will be found impoſſible.

This, I conceive, is enough for an Introduction to Experiments of this kind; which if any of the *R. Society* ſhall be ſo curious as to proſecute, I ſhould be very glad to be informed with what ſucceſs: That, if any thing ſeem to be defective, or to thwart this relation, I may have an opportunity of giving further direction about it, or of acknowledging my errors, if I have committed any.

So far this Learned and very Ingenious Letter; which having been by that *Illuſtrious Company*, before whom it was read, with much applauſe committed to the conſideration of ſome of their Fellows, well verſed in this argument, the Reader may poſſibly in an other *Tract* be informed of ſome report given in upon this Diſcourſe.

An

Alexandre Vassilievič Vassilieff.

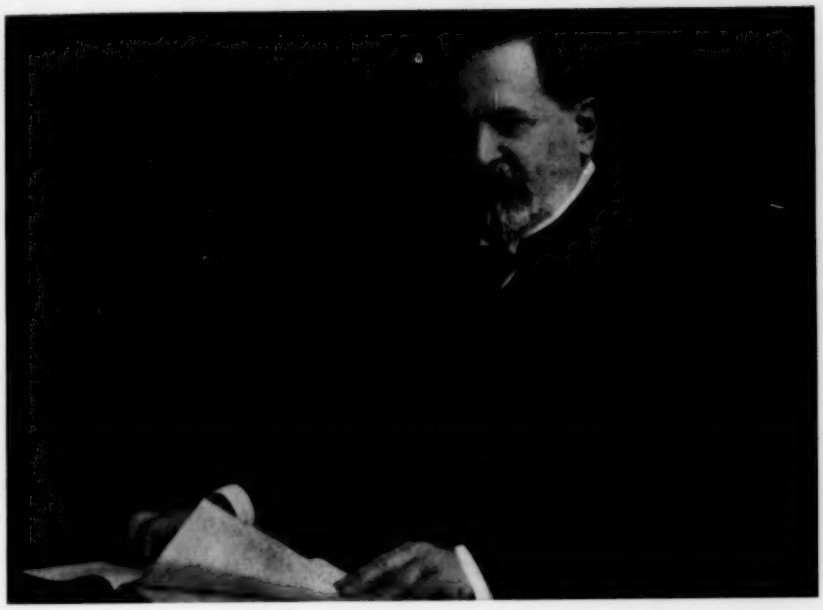
(Né le 6 Août 1855. Décédé le 6 Octobre 1929.)

A. V. VASSILIEFF occupa une place notoire parmi les savants peu nombreux qui se sont consacrés dans la Russie des Soviets à l'étude de l'histoire des sciences. Ce fut un de nos plus remarquables historiens des mathématiques et de la physique mathématique.

Comme la plupart de ses collègues russes, VASSILIEFF se consacra à l'étude de l'histoire des sciences seulement après être devenu mathématicien distingué et professeur de mathématiques à l'Université de Kazan. Les mathématiques et l'histoire des mathématiques n'absorbèrent pas entièrement cette remarquable intelligence. Il publia aussi une étude sur l'histoire de la propriété agraire dans l'une des provinces russes. A sa plume appartiennent également de nombreux articles dans les gazettes du pays de Volga, traitant diverses questions sociales. Pendant nombre d'années VASSILIEFF consacra aussi son temps et ses forces à une activité sociale dans le gouvernement local (le zemstvo) où il travailla à la propagation de l'éducation. Élu avant la révolution membre du Conseil de l'État, il se montra peu disposé à considérer ses fonctions comme purement honoraires.

Tout ce que VASSILIEFF fit, il le fit avec beaucoup d'ardeur, de tempérament et d'énergie. C'était une intelligence dont la vivacité touchait à l'inquiétude. Toujours plein d'initiative, il était prêt à répondre à toutes les excitations d'ordre intellectuel. Il n'a jamais appartenu aux esprits qui sont incommodés par un constant afflux d'idées nouvelles et de nouvelles théories. Tout au contraire, il les acceptait avec un enthousiasme juvénile, les faisait circuler et bientôt elles devenaient l'objet de ses propres et fécondes méditations.

La plupart des traits qui caractérisent la personnalité intellec-



A. V. VASSILIEFF
1855-1929.

T. RAINOFF.

tuelle de VASSILIEFF lui viennent de ses parents et grands parents.

Son père V. P. VASSILIEFF, professeur premièrement à l'Université de Kazan et ensuite à l'Université de Petersbourg, membre de l'Académie des Sciences, fut le plus grand sinologue russe du XIX^e siècle, jouissant d'une renommée mondiale, très célèbre par ses travaux sur l'histoire et la philosophie du bouddhisme. Il fut connu aussi comme l'auteur de plusieurs ouvrages importants sur la géographie de l'Asie et par ses articles sur les questions sociales à l'ordre du jour, parus dans les périodiques russes.

Du côté maternel A. V. VASSILIEFF était le petit-fils de J. M. SIMONOFF, contemporain et collègue de LOBAČEVSKY à l'Université de Kazan. SIMONOFF fut un astronome notable de son époque, qui sut mettre sur pied l'observatoire de Kazan, fondé par son prédécesseur LITTROW. Son tempérament social l'entraîna à remplir diverses fonctions administratives à l'Université, entre autres les fonctions de recteur.

Ces facultés intellectuelles heureusement combinées furent héritées par A. V. VASSILIEFF et transmises à ses descendants, et il n'est pas sans intérêt de constater que deux générations encore en font preuve avec assez de constance. La famille savante des VASSILIEFF présentera à ce point de vue un objet intéressant d'étude pour ceux qui s'occuperont des problèmes de l'hérédité.

A. V. VASSILIEFF naquit à Kazan le 6 Août 1855 et étudia les mathématiques à l'Université de St. Petersbourg, études qu'il termina en 1874 et où il travailla principalement sous la direction du génial ČÉBYCHOFF. VASSILIEFF sut beaucoup apprendre avec l'aide et sous la direction de ce remarquable savant dont plus tard, devenu mathématicien et historien des mathématiques, il célebra la mémoire.

Dès sa jeunesse VASSILIEFF sut garder une indépendance d'esprit qui lui permit, tout en adoptant les grandes idées créatrices de son maître, de ne pas rester insensible aux enseignements d'autres génies de son époque. ČÉBYCHOFF se montrait peu favorable aux idées de WEIERSTRASS et d'autres savants allemands qui essayèrent de fonder à nouveau la théorie des fonctions. VASSILIEFF était au courant des idées de WEIERSTRASS déjà du temps de ses études à l'Université. Devenu licencié en 1874 il fit à l'Université de Kazan un cours sur la théorie des fonctions de la variable complexe d'après la méthode de WEIERSTRASS, ce qui fâcha ČÉBY-

CHOFF. En 1879 VASSILIEFF fut envoyé se perfectionner à Berlin et en profita pour étudier de plus près le système de WEIERSTRASS.

Les débuts de la carrière savante de VASSILIEFF se rapportent à l'année 1874 (1). Nous ne ferons que mentionner les travaux mathématiques qui appartiennent au temps de son professorat à l'Université de Kazan, notre attention étant principalement fixée sur ses ouvrages historiques. Il fit deux thèses : la première sur « Les fonctions rationnelles analogues aux fonctions doublement périodiques » (publiée dans les *Annales scientifiques de l'Université de Kazan* en 1880) et la deuxième sur la « Théorie de la séparation des radicaux dans les systèmes des équations algébriques ». (Kazan 1884). Outre une série de mémoires, VASSILIEFF publia aussi plusieurs intéressants cours de mathématiques.

Qu'est-ce donc qui le détermina à s'occuper de l'histoire des mathématiques? Ce durent être ses études prolongées de la philosophie des mathématiques auxquelles il s'adonna sous l'influence des idées de ČÉBYCHOFF, de WEIERSTRASS, de LOBAČEVSKY et d'autres créateurs de la géometrie non euclidienne. Cherchant une solution aux problèmes qui se posèrent devant lui, lorsqu'il médita sur les principes fondamentaux des mathématiques, VASSILIEFF, comme beaucoup d'autres savants de la deuxième moitié du XIX^{e} siècle, se tourna pour les résoudre vers l'histoire des mathématiques, à laquelle il se consacra ensuite définitivement.

Le premier mémoire historique de VASSILIEFF parut dans les *Comptes-rendus de la Section des sciences physiques et mathématiques de la Société des naturalistes de Kazan*, t. IV, et est intitulé « Le rôle du professeur WEIERSTRASS dans le développement des mathématiques contemporaines ». Ce mémoire n'est encore qu'un premier essai historique et l'attention de l'auteur appartient entièrement à son époque.

Un autre mémoire, plus historique, est une sorte de synthèse des études mathématiques poursuivies par l'auteur sous la double influence de ČÉBYCHOFF et de WEIERSTRASS et de ses propres recherches historiques et est intitulé « De l'histoire et de la philosophie du nombre entier positif » (*Annales de la Société physique et mathématique de l'Université de Kazan*, t. I, 1891).

(1) Tous les travaux de VASSILIEFF parurent en langue russe excepté ceux que je mentionne à part.

Dès cette époque et, avec certaines interruptions, jusqu'aux derniers jours de sa vie, l'attention de VASSILIEFF sera constamment dirigée vers LOBAČEVSKY qui devient l'objet de ses recherches historiques et dont les idées le stimulent dans ses études sur la philosophie des mathématiques. Le nom de VASSILIEFF, le plus compétent biographe du grand géomètre de Kazan, restera à jamais dans la littérature relative à l'histoire de la géométrie non-euclidienne.

VASSILIEFF est l'auteur d'une série de mémoires, de discours et de livres consacrés à LOBAČEVSKY, dont nous ne mentionnerons que quelques uns. Après le discours prononcé en 1893 « NICOLAI IVANOVITCH LOBAČEVSKY» et traduit en plusieurs langues étrangères, en 1894 et en 1895 viennent deux opuscules : « LOBATCHEVSKY as algebraist and analyst » (*Bulletin of the New York Mathematical Society*, vol. III, 1894), et « LOBATSCHEWSKY's Ansichten über die Theorie der Parallellinien vor dem Jahre 1826 ». (*Jahresbericht d. Deutschen Mathematiker-Vereinigung*, 1894-95, IV); ensuite deux essais de biographie de LOBAČEVSKY. L'une de ces biographies intitulée « NICOLAI IVANOVIČ LOBAČEVSKY (1793-1856) » St. Petersb. 1914, est destinée à un cercle large de lecteurs. L'élément biographique y domine. Elle fut pendant longtemps la meilleure biographie de LOBAČEVSKY que nous avions en langue russe. En 1926, pour le centenaire de la publication de la géometrie de LOBAČEVSKY, la Librairie de l'État entreprit une réédition de ses œuvres. Une biographie devait les précéder et VASSILIEFF fut invité à l'écrire. Nonobstant son âge et les indispositions de la vieillesse, VASSILIEFF accepta et couronna ses longues recherches sur LOBAČEVSKY par cette œuvre fondamentale (plus de 350 pages). Peu de temps avant sa mort, il eut la satisfaction de voir son œuvre terminée et sous presse. Elle paraîtra bientôt en russe et sera traduite dans l'une des langues étrangères.

Le grand mérite des travaux de VASSILIEFF sur LOBAČEVSKY est leur excellente documentation. L'auteur a cherché dans les archives, où il a trouvé quelques nouveaux matériaux. Dépassant les limites d'un aperçu purement historique, il nous présente l'œuvre de LOBAČEVSKY à la lumière des idées mathématiques et philosophiques contemporaines, l'analyse et l'apprécie.

L'étude des travaux de LOBAČEVSKY amena VASSILIEFF à ses recherches sur l'histoire générale des mathématiques russes. Sa

reconnaissance envers son maître Čébychoff l'y déterminait également : en 1898, Vassilieff publie en français un mémoire « P. L. Tchébychoff et son œuvre mathématique » (*Bulletino di bibliografia e di storia delle scienze mathematiche*) qui fut traduit en allemand et parut à Leipzig en 1900.

Si l'étude de l'œuvre de Lobačevsky avait poussé Vassilieff à entreprendre des recherches sur les mathématiques du premier quart du XIX^e^ siècle, l'étude de Čébychoff lui fit approfondir ses recherches sur l'histoire des mathématiques du milieu et de la deuxième partie du même siècle. Cela lui permit plus tard d'accepter l'offre de l'Académie des Sciences qui, à l'exemple de la France, entreprit du temps de la guerre mondiale une histoire des sciences en Russie et invita Vassilieff à écrire pour cette édition l'histoire des mathématiques russes. Ce travail qui lui prit plusieurs années, ne fut publié qu'en partie. En 1921 parut en russe le premier opuscule intitulé : « Mathématique ». C'est un tiré à part de l'édition qui ne vit jamais le jour. Il embrasse la période de 1700 à 1863. L'année 1863 était choisie comme limite d'une époque au delà de laquelle commence un réveil général de la pensée mathématique russe. A cette seconde période, postérieure à 1863, Vassilieff comptait consacrer la deuxième partie de son histoire, qui ne parut pas, mais à laquelle il avait beaucoup travaillé, et dont il écrivit certains chapitres.

L'importance de l'œuvre entreprise et partiellement accomplie par Vassilieff pourra être appréciée à juste titre si nous nous souvenons que cette histoire des mathématiques russes est l'unique ouvrage spécial embrassant la période de 1700 à 1863 en entier. Malheureusement elle est fort succincte et, vu le manque dans la littérature russe de travaux monographiques traitant les questions spéciales, elle reste parfois simplement descriptive. Néanmoins son importance est considérable: c'est le fil conducteur pour toute une période de l'histoire et les futurs historiens pourront s'en servir dans leurs recherches sur l'histoire des mathématiques russes.

Comme nous l'avons déjà dit, Vassilieff chercha la solution de certains problèmes philosophiques dans ses études de l'œuvre de Lobačevsky. Un lien plus intime encore existe entre les méditations philosophiques de Vassilieff et ses travaux historiques concernant certains autres problèmes.

Ce sont d'abord des recherches, qui découlent en partie de

l'étude de LOBAČEVSKY : une étude historique de la théorie physique de la relativité : « Le temps, l'espace, le mouvement (deux éditions simultanées parurent en russe, l'une à Berlin, et l'autre à Moscou en 1921). La traduction anglaise fut éditée à Londres en 1925 avec une préface de BERTRAND RUSSELL et est intitulée : « Space, time, motion. Historical introduction to the theory of relativity ». Cet intéressant ouvrage essaie de retracer l'évolution des idées philosophiques qui servent de base à la théorie de la relativité, à commencer par l'antiquité grecque. L'auteur présume que la relativité physique découle nécessairement du relativisme gnoséologique, ce qui est problématique, comme l'est d'ailleurs la filiation historique qu'il retrace. Le travail de VASSILIEFF appartient cependant au nombre assez restreint d'ouvrages historiques sur la théorie de la relativité qui garderont problablement pendant longtemps leur importance.

Ajoutons que le dernier mémoire de VASSILIEFF : « Développement du concept scientifique de l'espace » (paru en français dans *Scientia*, 1929, N^os^ 10 et 11) est étroitement lié avec ses recherches sur l'histoire de la doctrine relativiste.

D'autres problèmes attirèrent encore l'attention de VASSILIEFF. Dès l'époque où il écrivit son mémoire sur l'évolution de la notion du nombre entier, il médita sur la continuité et la discontinuité, comme mode de pensée mathématique. Il nous a laissé deux ouvrages traitant ce problème.

Le premier est son livre « Le nombre entier » .(Petrograd, 1919). L'attention de l'auteur y est attirée par le rôle historique du principe de la discontinuité dans l'évolution de la doctrine du nombre entier. Ce travail, dont la majeure partie s'appuie sur une scrupuleuse étude des sources, (particulièrement pour la période du XVII^e^ siècle à nos jours) présente une grande valeur, surtout dans sa partie philosophique. L'auteur y montre combien l'évolution de la notion du nombre entier est étroitement liée avec le principe de la discontinuité dans la physique mathématique. Le second travail de VASSILIEFF dans cet ordre d'idées est consacré au rôle du principe de la continuité dans le développement des mathématiques — « L'analyse du continu et de l'infini ». Une aggravation dans la santé de l'auteur interrompit cet ouvrage qui ne fut pas terminé.

Ce court aperçu permettera peut-être de se faire une idée

de cette vie pleine d'intérêts d'ordre intellectuel et vécue pour le grand bien de la science. Combien de forces morales et d'énergie lui a-t-il fallu pour la vivre ainsi ? VASSILIEFF a passé par de nombreuses et lourdes épreuves. Loin de devenir moralement invalide, il sut cultiver ses facultés et faire preuve d'une féconde activité. Une intarissable énergie lui permettait de triompher de tous les obstacles. Quelques jours avant sa mort, sachant parfaitement qu'elle pouvait le frapper d'un moment à l'autre, il formulait encore trois vœux : assurer la publication de son dernier travail sur LOBAČEVSKY, publier son mémoire sur l'évolution du concept de l'espace, et inaugurer une école primaire dans un endroit peu fréquenté du pays. Ses deux premiers souhaits s'accomplirent : il vit ses derniers écrits sous presse. Le troisième était sur le point de s'accomplir. VASSILIEFF pouvait donc se reposer, trouver enfin le calme. Il continua, cependant, à s'agiter, à se presser. Ne fallait-il pas attirer l'attention internationale sur le projet d'une bibliographie des œuvres d'EINSTEIN ? Comment ne pas s'émouvoir par le peu d'attention accordée par les historiens au défunt écrivain et mathématicien espagnol ECHEGARAY ! Et combien d'autres pensées, d'autres projets encore agitaient cette âme si active et si infatigable.

Moscou, Janvier, 1930. T. RAINOFF.

Trotula

Trotta, Trota, Trotula, Trocta, Magistra operis, alias Eros Juliae, alias Trottus, alias Dame Trot ! Was ever a medical woman so burdened with names as TROTULA, who has been known since the eleventh century as one of the great medical teachers of the famous school at Salerno ? So numerous have been her names as to puzzle historians and to make some of them doubt her very existence; and if, as SINGER has suggested, tradition and legends are history misunderstood, then particularly to medical women of the twentieth century comes the duty of establishing the historic identity of TROTULA by tracing the legends back to their sources and so differentiating her from three men with whose names she has been connected in the course of a thousand years. One of these men was a Greco-Roman physician named EROS who was said to be a freed man of JULIA, the daughter of the Emperor AUGUSTUS; another was EROTIAN, a Greek physician of MARK ANTONY and CLEOPATRA in Egypt; and the third was an unknown writer possibly named TROTTUS, who may have lived at Salerno two hundred years later than TROTULA, and of whom only one manuscript has been found with the name abbreviated to « trot » or « tt ».

Since nobody has denied that there were women professors at Salerno's famous school during its entire existence, it is strange that anybody has questioned the identity of the most remarkable woman of them all, TROCTA or TROTA, a Magistra of Medicine who was said by her contemporaries to be the wife of JOHANNES I, PLATEARIUS, a writer and teacher of the eleventh century with whom she collaborated in the preparation of a great encyclopedia of medicine called the *Regimen Sanitatis*. Her name has been found by CAPPARONI in the Salerno church register of that period, and ORDERICUS VITALIS (1) tells us that in 1059 RUDOLPH MALA

(1) ORDERICUS VITALIS, *Eccles. Hist. of England and Normandy*. (Thirteenth century). Bohn Lib. Vol. I, p. 423. (1853).

CORONA, a Norman medical monk and nobleman, went to Salerno to study medicine with its great teachers and there found a « nobilis matrona » whom he could not equal in debate or argument. Unfortunately, ORDERICUS did not remember the name of this learned woman or the subject of controversy, probably some difficult interpretation of HIPPOCRATES or GALEN, but historians have always said that she was TROTULA. Names, however, were not considered of much importance before the end of the eleventh century. They were seldom signed to manuscripts, and though subsequent writers frequently plagiarized from TROTULA's book on diseases of women and children they rarely took the pains to give her credit for the work. Among the exceptions to this rule was BERNARD OF PROVINS, who, from 1150-1160, was one of the medical teachers at Salerno, « noch hundert Jahre später » (2) than she. He incorporated much of her material with some of his own, and HAESER tells us that her writings were often mistaken for his and *vice versa*. BERNARD makes fun of the charlatanism of the « mulieres Salernitanae » and of the tricks of the beauty specialists, but he praises « *Tortula* » and tells us that a nun in the convent of Merbach named GUTA, as well as many others, frequently copied TROTULA's books along with those of other members of the faculty, especially those of the PLATEARIUS family. Still another hundred years brings us to the poetic versions of the *Regimen Sanitatis Salernitanum* in which TROTULA's work is faithfully copied, though anonymously. A French translation of 1250 gives the prologue and all the chapters on gynecology in their original order, but without the mention of her name. From the thirteenth century we also have the *Thesaurus Pauperum* by PETER HISPANENSIS (3), better known as PETER THE SPANIARD or Pope JOHN XXI, in which TROTULA is mentioned by name as «*Trocula* » and quoted five times. This PETER was the son of a Portuguese physician. He became Bishop of Braganza in 1275 and Pope the following year (4). The *Thesaurus Pauperum*, printed in 1530, is a handbook of diseases and remedies compiled from many writers. The copy in the British Museum is a little

(2) HEINRICH HAESER, *Lehrbuch der Geschichte der Medizin*, 1875, ed. 3, I, p. 663.
(3) PETRUS HISPANUS, *Thesaurus Pauperum*, XIII century, printed in 1530.
(4) JOHANN HEINRICH ZEDLER, *Universal Lexicon*. Halle and Leipzig, 1734-1745.

worm-eaten volume of some sixty pages in fine print. Its Latin is difficult in places because of the abundant abbreviations, but there is no difficulty in reading the proper names of his authorities. Besides 'Trocula' he quotes from DIOSCORIDES, AVICENNA, RHAZIS, GILBERT THE ENGLISHMAN, GALEN, ISAAC, CONSTANTINE, the Circa Instans, ROGER, the surgeon, PLATEARIUS and MACER, often adding with evident approval « Hoc ego ». TROTULA is, therefore, in the best of company. PETER is more of an endocrinologist and much more of a believer in charms and magic than she. He tells us, however (p. 36) that *Trocula*'s treatment to cure sterility is to eat the powdered testicles of a boar, but to ensure sterility the patient must carry in her pocket the dried uterus of a goat. He quotes freely from her prescriptions for the complexion, and copies her methods of caring for difficult cases of labor (indirectly through her grandson, ROGER the surgeon). From that « arch plagiarist, CONSTANTINE THE AFRICAN » (SINGER), he takes TROTULA's treatment of suppressed menstruation by hot drinks and warm poultices to the abdomen, and fumigations to the nose and vulva. He approves by his « Hoc ego » of her use of suppositories of plantain leaves, red dog-berries, sanguinaria and oak galls for profuse menstruation, and of her mallow poultices for tumors of the breast (taken by her from DIOSCORIDES).

Coming to the fourteenth century we find that even in far-away England among the books mentioned by CHAUCER in the Canterbury Tales there were TROTULA's writings. In the Prologue (5) there is a character sketch of the Doctor of Physic in which it is said, « Well knew he the olde Esculapius » (p. 160) to which MANLY adds in a note (p. 526) « Even in the case of the « olde Esculapius » the allusion is probably... to Esculapii de morborum... which with the Trotulae curandarum aegritudinum mulierum... lib. formed the Experimentarius Medicinae ». We find also in the Prologue to the tale of the Wyf of Bath (p. 293) that among the books which her fifth husband read day and night « whan he hadde leyser and vacacion » was a certain volume containing « Tertullan, Crisippus, Trotula, and Helowys », etc., to which MANLY adds a note (p. 582) « The Wyf of Bath was fairly familiar with the contents of her husband's books,... TROTULA was a famous

(5) *Canterbury Tales* by GEOFFREY CHAUCER, Introduction, Notes, and Glossary by JOHN MATTHEWS MANLY, 1929.

woman, associated with the great medical school of Salerno ». MANLY then refers us to HAMILTON (6) who tells us that in most of the libraries her books were referred to as Trotula Major and Minor, or as the Trotta and the Trotula, but as time went on they were gathered into one volume and somewhat abridged.

That the copyists took great liberties with the works from which they quoted as students and writers do to-day can not be doubted. CHOULANT (7) says that at least one of the copies of TROTULA was made by a woman doctor of the thirteenth century, (may it have been the nun GUTA of the twelfth ?), who took the usual liberty with the original, adding several later Arabic remedies and changing the style to suit her own times. HAMILTON says that this version was the one commonly used by the translators into French, German and Old English, as well as into Latin verse. SPITZNER (8) tells us that such a French translation was made in the fourteenth century and that in a pseudo text of ALBERTUS MAGNUS, the *Secreta Mulierum*, TROTULA was highly praised : « *Premierement je vous di que une feme qui fu philosophe appelee Trotula, qui mout vesqui et fu moult belle en sa jeunece, de la quelle li phisicien qui riens sevent tiennent moult d'auctoritez et de bons enseignemenz, nous dist une partie des natures aus femes* ». etc. This may be used to prove that at that time TROTULA was still considered very much of an authority as well as to show us that even in those days the average physician took ready-made prescriptions from any source which seemed to him reliable.

Turning now to JAMES's catalogues (9) of the manuscripts in the libraries of Canterbury and Dover before the days of printing or of the dissolution of the monasteries, we find many volumes of TROTULA. Among the chained books in the Dover Priory, No. 347, p. 481, was a volume containing the Sirurgia Rolandi, Tabula Platearii de herbis, Quid pro quo, Trotula maior (beginning as is usual with « cum auctor universitatis Deus »), Alphita vel sumonoma, Circa Instans, Epistola albrici de herbis, Thesaurus

(6) GEO L. HAMILTON, Modern Philology, Vol. IV, 1906-1907, p. 377.

(7) CHOULANT, *Jahrbuch f. d. deutsche Med.*, Vol. III, p. 144.

(8) HERMANN RUDOLF SPITZNER, Inaugural Dissertation, *Die salernitanische Gynäkologie und Geburtshilfe unter dem Namen der Trotula*, Leipzig, 1921, p. 38.

(9) MONTAGUE RHODES JAMES, *Catalogue of the Ancient Libraries of Canterbury and Dover*, 1903.

pauperum. In No. 337 was a Parvus Gyrardus, and in No. 355 a Gyrardus magnus along with Trotula maior and other Salernitan writings. In the catalogue of the Abbey of St. Augustine at Canterbury JAMES found several manuscripts of CONSTANTINUS in one of which, Fol. 85, p. 334-335, were bound manuscripts of SORANUS and of CLEOPATRA the gynecologist. In Fol. 88, No. 1219, is *Trotula maior* de curis mulierum. Fol. 89, No. 1225, has *Trotula minor* et Genecia cleopatre et dialogus muscioni, et Genecia muschionis et est de officio obstetricis ». There were one hundred and two medical books in this library before Canterbury was burned in 1097, and though the library was burned again in 1166 it contained three thousand books, mostly manuscripts, when the monastery was suppressed in 1539. If we look through JAMES's catalogue of the library of Christ Church, A. D. 1170, we find the titles of several Salernitan books. In No. 475, a Breviary, there is a *Practica domine Trotta ad provocanda menstrua*. In No. 477 is the title *Tractatus de ornatu mulierum*, ascribed to PLATEARIUS rather than to its rightful author,—Trotta —his wife. No. 495 contains TROTULA's treatment for dropsy and fever, taken from the *Genecie, Cleopatrae ad theodatum*. No. 496 is another book which TROTULA must have studied; it is the *Liber Galeni*, containing also the gynecology of SORANUS, all of whose methods she followed except his podalic version which, as performed by the average midwife, must often have caused puerperal fever. This book through a mistake of the copyist, curiously enough, was dedicated to CLEOPATRA, the Queen, rather than to CLEOPATRA, the gynecologist. In No. 511 we find the *Summa de Viciis matricis* containing the familiar *Liber de curationibus mulierum* of TROTULA.

SPITZNER (10) has given us the names of nineteen manuscripts

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(10) SPITZNER, loc. cit., pp. 19-21, gives us the following incomplete list: Manuscripts of the thirteenth century;

Brussels, Bib. Royal, 14339. *De cura Trotula*, beginning « *Cum auctor* »... etc
Montpellier, No. 317, Ditto.
Cambrai, No. 916, Ditto.
Oxford, No. 1427. Ditto.

Leipzig, A.D. 1300, No. 1215. *Trotula bonae matronae de aegritudinib.*, etc.

Manuscripts of the fourteenth century;

Breslau, Codex XXXII, a, *Liber de passionibus mulierum.*
b, *Trotula minor.*
Cambridge, *Trotula, De passionib.*, beginning, « *Cum auctor* »...

of TROTULA now in libraries in France, Germany, Belgium and Austria, and one each in Oxford and Cambridge. The oldest yet discovered is in the library at Breslau. DE RENZI (11) speaks of its Latin as written in the eleventh century but in the Beneventan style of the tenth. It is the *Practica* of Salerno containing the *Trotulae mulieris Salernitanae de curis mulierum*. Others in Breslau and Munich contain the *De mulieris passionibus ante, in et post partum* of TROTULA. Several of TROTULA's manuscripts have been found in Paris. In the Bib. Nat. Nos. 696 and 705 are of the thirteenth and fourteenth centuries. The first is the *Summa quae dicitur* TROTULA, and the second contains her surgical teachings as explained, or copied by her grandson ROGER, the surgeon. In a Codex in the same library DE RENZI also found a copy of the *Liber de passionibus mulierum secundum Trotulam*, bound with a book on practice by BERNARD GORDON and the *Synonyms* of NICOLAS. This is in the style of the fourteenth century, and another like it, No. 8654, begins, « *Trotula maior quaedam sunt mulieres in utilis ad conceptionem*, etc. »

From this probably incomplete review of the extant works of TROTULA in manuscripts of the four centuries following her activities, we see that from no source were any doubts expressed as to her identity, or her celebrity. It was not until the fourth, fifth and sixth printing of her books that her name became confused with that of EROS JULIAE. MELZI (12) assures us that this was a

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Brussels, Nos. 14325, and 15486. Ditto.
Munich, No. 570. Ditto.
Rouen, No. 981. Ditto.
Carpentras, No. 320 (?) Fragment, Ditto.
Breslau, *Practica*, and *De ornatu mulierum*. (III, F. 10).

Manuscripts of the fifteenth century;

Munich, *De secretis mulierum secundum Trotulam*. Nos 660, and 3875.
Vindob, *De Mulierum aegritudinibus*, (A.D. 1444). No. 5388.
Wolfenbüttel, Ditto. No. 875.
Paris, Bib. Nat. No. 1327, *Du régime dez dames pour leur aydier en leur maladie*, etc.
Paris, Bib. St. Geneviève, No. 1037. Fragment de tradition française.
Laon, No. 418. *De passionib. mulier.*
Wiesbaden, No. 56, Trotula, et Arnold-Villanova. « Nota, aliqua de Trotula excerpta ».

(11) SALVATORE DE RENZI, Collectio Salernitana, 5 vols. 1852-1859.

(12) GAETANO MELZI, *Dizionario di opere anonime e pseudonime di scrittori italiani*, Vol. III, p. 178, 1848. COLUMELLA suggests that TROTULA dictated this to a scribe,

grave error. He quotes COLUMELLA who says « Those who call TROTULA a man are wrong », and he cites her own autobiographical notes in proof of her studying medicine in order to help other women, and at their urgent request (13).

In the fifteenth century printing presses were set up in many parts of Europe for the general multiplication of books by an easier method than by the pen or brush. Twenty editions of the *Regimen Sanitatis Salernitanum* or *Flos Medicinae Salerni* were printed before A. D. 1500. To the original compilation of this work, as we have seen, TROTULA contributed together with her husband, PLATEARIUS, and other members of the famous faculty. But the first printed edition of TROTULA's *De Passionibus Mulierium* came from the press of JOHN SCHOTT, in Strasburg, in 1544 (14). Other editions followed in 1547, 1554, and 1555, in none of which was her identity questioned. In 1566, however, WOLPHIUS or WOLFF, in Basel, published an edition of her gynecology in which for the first time we find the title page attributing the work to « Eros quem ineptè Trotulam nominant ». This title was again copied by WOLFF (15) in 1586 in GESNER's Gynaecia, adding « longe quam ante emendatior ».

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as was commonly done, and so used the third person singular instead of the first. He adds that it was TOMASO BARTOLINO in his Legendis Libris who first falsely attributed TROTULA's writings to EROS JULIAE (Cf. TOMASO GUARINO).

(13) In the earliest manuscript of Breslau we find the text as follows. « Quapropter ego, miseranda illarum calamitate, (cioè delle donne), praesertim cujusdam matronae instigatione, compulsa, incoepi diligentius contemplare de aegritudinibus quibus foemineus sexus saepissime molestatur ». Another text has, « animum meum impulit... ex libris YPOCRATIS, GALENI, » etc. In the Oxford copy some one has added the name of CONSTANTINE to her list of authors, and in the Leipzig text CLEOPATRA's name is given in place of CONSTANTINE.

As another bit of autobiography we have the famous sentence, « Trotula vocata fuit quasi magistra operis... et admirata fuit quam plurimum ». In the Oxford text fui is given instead of fuit. In the Leipzig text we have « invitata fuit quasi magistra... et admirata fuit », etc. It is to be noted that in none is the participle in the masculine gender.

Note. Many of the manuscripts once at Canterbury were bought by LORENZO DEI MEDICI and are now in the Laurentian Library in Florence. Among them is TROTULA's « *In utilitatem mulierum et pro decoratione earum, scilicet de facie et de vulva earum* ».

(14) TROTULAE, *Experimentarius Medicinae*, etc. Argent, apud JOANNEM SCHOTTUM, Anno Christi M.D. XLIV.

(15) WOLFF, *Erotis Medici Libertati Juliae, Quem aliqui Trotulam ineptè nominant, Muliebrum Liber*. 1566, Basel.

It is rather puzzling at first glance to understand how this confusion of names could have come about. If, however, we take into consideration the difficulty of deciphering manuscripts and the ignorance of type-setters as to the subject of the copy as well as of the language, and the fact that EROTIAN's commentaries on the Hippocratic gynecology and that the book of EROS JULIAE on the care of the complexion and the diseases of women had been printed in Strasburg during the interval between the printings of TROTULA, we may explain the blending of the names on the supposition that a peripatetic journeyman printer in the sixteenth century was given a poorly written and faded manuscript in the old and difficult Beneventan script of the eleventh century, and knowing nothing of medicine or of TROTULA he mistook her name for that of EROS. In mediaeval manuscripts the T and E are easily interchanged, and the second t might appear to be sj if these two letters were run together without a capital J as was not uncommon. So we have Trot=Eros, Trotula=Erotula, Trosulae=Erosjulae (16).

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(16) The popular work of EROTIAN was published in Strasburg in 1552, and that of EROS, also in Strasburg, in 1564. EROTIAN may have been a physician to MARK ANTONY or it may have been he who was physician to NERO. His translations from the Greek of HIPPOCRATES were continually used by medical students before the great influx of refugees from Constantinople in 1453. BARTOLOMAEUS EUSTACHIUS retranslated the text from the library of LORENZO DEI MEDICI and published it in 1564; in 1567 it was published in Strasburg, this time, according to VOSSIUS, the translation was by HERODIANUS EUSTACHIUS. Thus we see a further confusion of names, EROS and EROTIAN, BARTOLOMAEUS, or BARTHOLINUS EUSTACHIUS and HERODIANUS EUSTACHIUS, and finally, still further complicated by FABRICIUS (*a*) who found an edition in the library of HADRIANUS JUNIUS, in Nuremberg, and he tells us that BARTOLINUS and HADRIANUS JUNIUS started the theory that TROTULA was a man named EROS JULIÆ. Thus we can understand the eclipse of TROTULA who became merely an unknown somebody, a mere ghost of her former self.

But there was still another amusing guess as to TROTULA's identity, based on the supposition that though the Latin of EROS was so poor that AETIUS did not recognize him as an Augustan a copy of his book may have fallen into TROTULA's hands, and she may have admired it sufficiently to call herself EROS. Or, since the word Eros means desire, or treasure, or passionate love, she may have taken it as her *nom de plume* in order to attract attention, an absurd supposition as applied to a sober medico-gynecological treatise.

And still another hypothesis is based on a manuscript signed Trot, or annotated trot', t^{o}t', tot', which has been translated by the school of SUDHOFF as TROTTUS. HIERSEMANN, a pupil of SUDHOFF, (*b*), took this for his inaugural thesis, but he found no proof of the existence of any Salernitan *Trottus*, nor is the manuscript

ZEDLER, in his famous Lexicon, admits the possibility of this blending of the two names, but it has generally been overlooked by authors and one after another has unquestioningly copied the « Eros quem ineptè Trotulam nominant », regardless of the fact that TROTULAM is feminine and EROS not once mentioned in the text or referred to by later writers. It has even been suggested that the text may have been by one Trottus, a « mere man » according to SINGER, but rather a mere ghost of a man about whom even his exponents can find nothing in the way of history or even references.

Another absurdity in substituting EROS for TROTULA is that these two writers lived a thousand years apart. In the TROTULA texts most of the authors cited could not possibly have been known to EROS. GALEN was not born until EROS had been dead nearly two hundred years, and with the exception of HIPPOCRATES, CLEOPATRA, and SORANUS, the authors quoted in the text were all mediaeval. For this reason TROTULA, herself, could not have

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either on gynecology or in the style of TROTULA. It is obviously of a later date than the eleventh century, and of him no contemporary has even made honorable mention. What the abbreviations Trot', trot', tt', t°t', and t°, mean it is difficult to imagine. The author says that we may read the word trod or tort, and because it is in one place capitalized we may call it a proper name, *Trottus*; moreover, since the second part of the manuscript is compiled and in places copied verbatim from the *Practica* of Salerno, *Trottus* is assigned to Salerno subsequent to CONSTANTINUS AFRICANUS and his *Liber aureus*. Of the seven authors of the *De aegritud. curatione*, listed by name in the Breslau manuscript, trot' is the only one not called « Mag. » and TROTULA was a Magistra according to the testimony of her manuscripts. HENSCHEL and DE RENZI have, therefore, more reason to translate Trot as TROTULA than HIERSEMANN has to call it TROTTUS, but neither may interpret the cypher correctly. It may stand for totius or tortius, and it may mean the whole or merely a circumlocution. The text itself is full of abbreviations. (Codex Salernitanus, Breslau, Stadtbibliothek, No. 1302); for example, o may stand for oculos, oculis or oculorum, fr... o may be frigido, etc. Chap. X begins, « Ad vomitum restringendum, accipe oleum et acetum et simul t°t bullias ». Item ad vomitum reprimendum,... veteri bibe per quinque dies probatum est. (t°t'), V d... itu. trot' ». The next chapter begins, « de eodem trot ». Thus we may dismiss *Trottus* as not proved. The only writers of that name in the catalogue of the British Museum are two churchmen of the fourteenth and sixteenth centuries who wrote on religious subjects.

(*a*) FABRICIUS, Bibl. Gr. VI, 7, p. 700, Bodleian lib. (Hyde), Basel, 1566. and Bibl. Barberini, Zedler, 1586.

(*b*) CONRAD HIERSEMANN, Inaugural-Dissertation. Leipzig, 1921, Die Abschnitte aus der Practica des Trottus in der Salernitanischen Sammelschrift De Aegritudinum Curatione. Breslau Codex Salern. 1160-1170 (based on the seven authors of Salerno).

been a Roman matron, as some one has suggested, for to a medical student of the eleventh century, but not earlier, could all her authors have been known.

For the sake of accuracy we should study the early printed editions (17) of TROTULA and make ourselves conversant with her style and her methods of treatment, bearing in mind the carelessness of the students and monks who copied manuscripts, and the general disregard of proper names. As has been noted above the first edition of TROTULA was published in Strasburg, in 1544 by JOHN SCOTT or SCHOTT or SCOTTUS (18) who informs the reader that she was a great and learned woman... « as may be seen from the twenty chapters of this book, the *Experimentarius Medicinae.* » The title is further expanded in explanation of its contents : « *Trotulae curandarum aegritudinum mulierium, ante, in & post partum Lib. unicum, nusquam antea editum. Quo foemini sexus accidentes morbi & passiones, Infantum & puerorum à partu cura, Nutricis delectus, ac reliqua ijsce adnata, Dispositiones utriq. Sexui contingentes, Experimenta denique variarum aegritudinum; cum quibusdam medicamentis decoratione corporis inservientia, edocentur* ».

The volume is a large folio beautifully printed and it contains besides TROTULA's work those of ORIBASIUS on materia medica, THEODORIC on diet, the famous ESCULAPIUS on the treatment of diseases, and four books of HILDEGARD on natural sciences. The prologue to « *Trotulae Librum de Passionibus Mulierum* » begins, as in the old manuscripts, with the theological doctrine that when the Creator of the universe made men and women (« cum auctor universitatis Deus » etc.), He endowed both with reason, intellect, and freedom, but to women he gave weaker

(17) SPITZNER (*loc. cit.* p. 4), gives us the most recent list of the printed editions of TROTULA, as fols. (SCOTT) Strasburg, 1544; Venice, 1547 and (FAVENTINUS) 1554; Aldine, 1554, Paris 1550; Basel (WOLFF) 1566, ed. TH. GUARINUM, and 1568, ed. CASPAR BAUHINUS; (SPACH) Strasburg, 1597; a German translation by SYLVESTER HARDTLIEB, in 1590, together with *Secretis Mulierum* by ALBERTUS MAGNUS (?); Leipzig, (KORNMANN) based on the Aldine, 1778. SPITZNER admits that in these various editions there is very little difference in form and none in the important points.

(18) « Quae vero haec fuerit Trotula, certe non vulgaris, quinimus multae peritiae et eruditionis foemina, ut ex XX capite libri huis videre licet ». SCOTT also calls the editor of the volume, GEORGE KRAUT, a most learned and skillful doctor.

bodies than to men, and cold and moist natures instead of hot and dry, thus following GALEN.

Ten years after this volume was published by SCOTT there was an edition published in Venice in 1554 by VICTORIUS FAVENTINUS (19) who also praises TROTULA and her work in the highest terms. He says that he has personally tested many of her remedies and that her work had never before been published, (as SCOTT had said in 1544). It contains her chapters on parturition, the care of sick children, the choice of a nurse, the treatment of the complexion, etc. He calls particular attention to her use of fumigations by means of sweet odors to the nose and acid vapors to the vulva to cure prolapsus uteri, spicy drinks and friction to the abdomen to mitigate the pains of labor, and oil of savin to provoke labor or to cause abortion in necessary cases. He was, however, more of an advocate of phlebotomy than TROTULA, and for this and other reasons he says that he added « certain inventions of his own for the glory of the Venetian Republic and of the reigning Pope ».

Still another early printed book in which TROTULA is praised was the *De Nobilitate* by TIRAQUELLUS (20), published in Lyons in 1566. TIRAQUELLUS compiled a sort of Who's Who of the great people of history. In the chapter on *Foeminae Medicae* he gives a list of medical women mentioned by classical writers, HOMER, OVID, PLINY, GALEN, AETIUS, etc., including TROTA, No. 31 in his list, whom he calls «TROTA, sive TROTULA Salernitana, quae morbos mulierum et eorum curam scripsit.» « TIRAQUELLUS justly praised TROTULA », says TOPPIUS (21), « TROTTA quem alii TROTULAM vocant, miris sane encomiis celebranda ut notavit TIRAQUELLUS ». He very carefully differentiated women doctors from nurses and midwives, and he praised the « parabolani » who went daily to the hospitals visiting the poor and the sick and treating them « with kindness and with skill ». Since the

(19) VICTORIUS FAVENTINUS, Empirica. Venice. 1554. FAVENTINUS says in the prologue « Trotulae antiquissimi auctoris curandarum aegritudinum muliebrium liber unicus ».

(20) ANDREAS TIRAQUELLUS, *De Nobilitate*. Lyons, 1566. TIRAQUELLUS was a great lawyer and jurist, a French Count of Poitou. He died A.D. 1558, at the age of eighty, leaving forty-five children by his two wives, one of whom published this book after the death of the author.

(21) NICOLAS TOPPIUS, *Biblioteca Napolitana*, 1678.

existence of most of the women doctors whom TIRAQUELLUS mentioned has never been questioned his authority should be good in regard to the personality of TROTULA.

Unfortunately, however, this very year, 1566, WOLFF or WOLPHIUS, of Basel, printed his edition of TROTULA in which for the first time we find the « EROS JULIAE » on the title page, and from that date until the present there have been certain skeptics (22) or « unchivalrous mythoclasts » who, according to OSLER (23), « have deprived the first woman professor of more than her chair », by doubting her very existence.

It is curious that after this edition of WOLFF no editor or publisher noticed the incongruity of copying the text of TROTULA under the name of EROS, who is not mentioned once in the pages of the book. As we have seen, EROS of the Augustan Age had nothing to do with the school at Salerno, not even by tradition, while to TROTULA of Salerno GALEN and the Saracens, PRISCIAN and PAUL OF AEGINA, Arabic doctors and French remedies were well known and freely quoted. In the edition of the *Gynecia* by CONRAD GESNER, published by WOLFF, as we have seen, in 1586, the new title is copied, and in the great folio of ISRAEL SPACH (24), published in Strasburg in 1597, we have the same « EROS » or « EROTIS Medici... quam aliqui TROTULAM ineptè nominant ». And somewhat later it was copied again by GEORGE SCHENKINS who elaborated it to « EROTIS Medici et JULIAE AUGUSTAE libertatum volunt, et TROTULAE corrupto vulgo nomine inscribitur ». SPACH's large volume of more than a thousand pages contains articles by twenty-one writers on the diseases of women, two of which, by AMBROISE PARÉ and RUFFUS are illustrated. TROTULA's article is evidently from one of the earlier manuscripts and as usual the prologue begins « Cum auctor universitatis Deus » etc. The chapters follow her usual order. The famous mention of herself as Magistra, in the third rather than the first person, is in chapter XX, on the treatment of post

(22) *Essays on the History of Medicine*, presented to KARL SUDHOFF. Article on the Origin of the Medical School of Salerno, by CHARLES and DOROTHEA SINGER, 1924.

(23) WILLIAM OSLER. *Bibliotheca Secunda*. No. 3899.

(24) ISRAEL SPACH. *Gynaeciorum sive De Mulierum tum Communibus, tum gravidarum, parientum Libri*, etc. *Graecorum, Arabum, Latinorum, opera & studio*, ISRAELIS SPACHII, Med. D., Profess. Argentiensis, 1597.

partum accidents. It is this chapter which has caused many writers (cf SPITZNER) to argue that the book was not written by TROTULA but possibly by a student, (docent), or someone else who chose to write a book for midwives and name it for her (25).

One of the other authors of an article in SPACH's collection is HIERONIMUS MERCURIALIS, (1530-1606). He devotes many pages to the treatment of sterility. He quotes freely from the old Greek, Roman, and Arab writers but little from the Salernitans by name except from TROTULA. On p. 224 he quotes « TROTULA medicus, (!) quem mulierem fuisse putant », etc., as praising a certain condiment made of beans to cure the depraved appetite of pregnant women. In Liber Secundus, on abortion, p. 236, he quotes not only PICO MIRANDOLA, the Arabs, PYTHAGORUS, and PLINY, but also TROTULA. « Est etiam aliud medicamentum propositum à TROTULA, & confirmatum ab AVICEN ut mulier tempore partus Magnetem manibus teneat ». Fortunately he does not accuse her of magic or connect her with the « unethical methods» of the obstetrices and other « Medici » who profited by « opening the uterus in several ways ». In Book three he seems to call her « the old *Tuenda* », evidently a misprint, and he says she

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(25) The page headings to the part written by TROTULA are simply « EROTIS. De Passionib. Mulier ». In the prologue GALEN is mentioned once and twice in chap. I. In chap. II mention is made of the prescriptions of a doctor who lived in France ,though in the time of EROS France was part of « all Gaul ». In chap. III GALEN is quoted twice along with prescriptions for sterility by a doctor JUSTIN. In chap. V GALEN is quoted again and twice in chap. VIII, and PAUL OF AEGINA is also mentioned. Chap. X brings in both GALEN and HIPPOCRATES. Chap. XI refers to GALEN, PRISCIAN, and PAUL. Chap. XIII quotes GALEN on the position of the foetus in utero. Chap. XVII has « dixit enim COPHO », who, as we know was one of the early Salernitan writers, a teachers of anatomy. Chap. XVIII is wholly TROTULA's on the care of the infant, and chap. XIX contains her rules for the choice of a nurse. Chap. XX is the famous one in which as a consultant TROTULA is summoned as the « magistra operis » and also in the treatment of post partum accidents where « TROTULA admirata fuit quam plurimum », especially in cases of ruptured perineum and abscess of the vulva as distinguished from hernia. Chap LXI concerns prescriptions of the « Mulieres Salernitanae » and other women for offensive breath and sore eyes. Chap. LXII contains the Hermetic teachings regarding medicated baths to ward off old age, a very popular part of the *Regimen Sanitatis*, and chap. LXIII gives us the prescriptions of MASTER GERALD for the eyes so much praised by TROTULA. In fact from the very first word of the prologue, « Cum auctor universitatis Deus », to the Finis of the EROTIS the work is by TROTULA.

taught her pupils that milk was the best food fot little boys, (p. 239) ... « quod autoritas libri primi de *Tuenda valetud.* videtur contraria alteri autoritati GALENI ». This advice corresponds with that in TROTULA's chapter XIX on the choice of a nurse and the value of woman's milk for babies (26).

Thus we have seen both from the manuscripts and also from the printed editions of TROTULA that she was a very real and very important person. Moreover, we may not sneer at her because she made use of older material in her writings. SARTON (27) says that Salerno was for a long period a great distributing center of medical literature, from which it was the fashion to quote anonymously, and certainly it was no new fashion. GALEN's system of medicine was a universal source and it was taken without question for fifteen hundred years by every writer. The *Euporista* of ORIBASIUS of the fourth century was the basis of the treatment of diseases in general. The gynecology of CLEOPATRA, of the first century B. C. was filtered through SORANUS of the second century A. D. and AETIUS of the sixth. Pediatrics came from PAUL OF AEGINA of the seventh in his *De Re Medica*. The anatomy came from GALEN through COPHO, a contemporary of TROTULA. But besides all of the borrowings there is a great deal of originality in the Salernitan writings and especially in those of the Magistra. NEUBURGER (28) speaks of a thirteenth century manuscript of *De Mulierum passionibus* as « probably based on TROTULA, one of the famous mulieres Salernitanae who taught and wrote medical treatises in this truly medical atmosphere ». He also considered her one of the seven most eminent doctors of Salerno—as taken from the Breslau manuscript,—PLATEARIUS, COPHON, PETRONIUS, AFFLACIUS, BARTOLOMAEUS, FERRARIUS, and TROTULA; although according to HIERSEMANN cf. p. 7, the « Trot » might be interpreted as Trottus.

Having followed TROTULA through the sixteenth century when she became EROS we find no further controversy on the subject until the time of MAZZA, who, in 1681, came out in her defense (29).

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(26) HIERONYMUS MERCURIALIS, *De Morb. mulieb.* SPACH. 1597.

(27) GEORGE SARTON, *Introduction to the History of Medicine.* Carnegie Pub. No. 376.

(28) MAX NEUBURGER, *History of Medicine*, p. 25, 1906.

(29) ANTONIO MAZZA, *Historiarum epitome de rebus Salernitani*, Naples, 1681.

He tells us that in many parts of the world men were busily copying the old *Regimen Sanitatis* even though there was at Salerno a modern medical school and famous medicinal baths. The families of ROGER, PLATEARIUS, and GUARNA were still ably represented by men and women who taught in the university,—« eruditas enim multas habemus mulieres quae non nullis viris ad multa praestantiores, ipsoq; doctrina, vel vicerunt, vel aequarunt; nam ad medicam facultatem mulieres sicut ad viros aptas scripsit PLATO & MARTIALIS cecinet »... Fluorere igitur in Patrio Studio docendo, ac in Cathedris disceptando ABELLA, MERCURIADIS, REBECCA, TROTTA, quam alii TROTULAM vocant, miris sane encomiis celebrandae ut notavit TIRAQUELLUS, (cf. NICOLAS TOPPIUS, note 21), ac SENTIA GUARNA, ut ait FORTUNATUS FIDELIS (30).

But though in the seventeenth century we find TOPPIUS and MAZZA taking up cudgels in defense of TROTULA as against EROS, in the eighteenth CHRISTIAN GODFRED GRUNER (31), in 1773, denied her identity, chiefly because he thought that no woman of the eleventh century could have written what was attributed to her, and as he realized that the work could not have been written before the Christian era he also denied that it was written by EROS. His thesis is, therefore, « Neque EROS, neque TROTULA, sed Salernitanus quidam Medicus isque Christianus, Auctor Libelli est qui de Morbis mulierum inscribitur ». Nor did he think that the book was merely a compilation from many ancient writers by some EROTIAN of the Middle Ages, for any man who could write such a book would at least have been mentioned in the lists of great doctors compiled by AETIUS, or COPHO or FABRICIUS. Evidently the copy of TROTULA in GRUNER's hands was a late one, for it contained many Arabic remedies of which she could not have known in the eleventh century. (32)

Thus we have seen that though in certain medical publications the identity of TROTULA has been confused with that of EROS and TROTTUS, it is not necessary to quote further from DE RENZI,

(30) FORTUNATUS FIDELIS, in *Medic. patroc.* Book II, chap. 12.

(31) CHRISTIANUS GODFREDUS GRUNER, Medicinae doctor Botanices ac theoretices professor publicus ordinarius. *Neque Eros, neque Trotula*, etc., Jena, 1773.

(32) For the theory that TROTULA's writings were a mere compilation see KESTNER, *Med. Lexic.* p. 864; HERMANN CONRINGUS, *Introduc. in Art. Med.* p. 193; THOMAS BARTHOLINUS, Diss. *De Libr. legend.* VI, p. 132; CLERICUS, *Hist. Med.* v. III, p. 12, STOLLIUS, *Hist. Med.* P, II, c. 1, p. 744.

her defender in the middle of the XIX century, nor from her modern opponents, SUDHOFF and his school, as to the authorship of the books attributed to her, and we can certainly clear her name from that of Old Dame Trot of the nursery rhymes.

To any woman doctor of the twentieth century, therefore, there would seem to be no good reason for denying that a book having such decidedly feminine touches as TROTULA's was written by a woman. It bears the gentle hand of the woman doctor on every page. It is full of common sense practical, up-to-date for its time, in fact far ahead of the eleventh century in its surgery and analgesics as well as in the care of the mother and infant during the post partum period. No book so good of its kind had ever been written, and none followed it for centuries except certain *Hebammen* books inspired by it. Even SINGER, who refers to her as Old Dame Trot, admits that of all the books said to have been written by Salernitan women only that attributed to TROTULA has come down to us. As for Old Dame Trot the few references to her that I can find in our Nursery Rhymes would certainly not lead us to suspect that the original Dame was a learned doctor or even a competent monthly nurse, for they merely give her the character of a silly old woman who danced when Tom, the Piper, piped until she broke all the eggs in her basket, or they associate her with a pet cat to which she talked whimsically. An eminent philologist has suggested that the name of Old Dame Trot may have come from the French verb *trotter*, signifying to run back and forth with little steps, in fact a homely busy-body very unlike TROTULA. It required a learned if not a married medical woman to write as she wrote. From experience with her own children as well as with patients in a clinic, and from the study of GALEN, HIPPOCRATES, and other medical predecessors she achieved renown as a skillful physician, and if she did not blow her own horn as persistently as certain other writers blew theirs she certainly did not lack friends who kept her memory green. Therefore, in this the woman's era or their renaissance, TROTULA should not be consigned to oblivion or classed as a man doctor (33).

(33) Speaking of TROTULA's family history, HAESER says: « JOHANNES PLATEARIUS I ist der Begründer einer berühmten Salernitanischen Familie von Aerzten; — TROTULA, vielleicht seine Gattin, ist die älteste und berühmteste der medizinischen

It has recently been said by a careful historian that one who contradicts SUDHOFF or SARTON must be sure of his facts. I have been for that reason reluctant to touch this subject, inasmuch as most of the recent doubts as to TROTULA's worth as a woman doctor and writer seem to come from HARTMANN (34) and the followers and pupils of SUDHOFF, such as SPITZNER and HIERSEMANN. HAESER, (see note p. 16), believed in her and in her family history, but SARTON (35) finds nothing to substantiate this ascription and classes her among the learned midwives. We have seen that she was much more learned than a midwife or nurse and in fact she herself gives directions for calling a midwife to attend labor cases. DAREMBERG (36) defends the personality of TROTULA and praises her medical knowledge and skill. He commends her ideas about honey cakes and syrupy medicines for children, her soothing lotions for the aching gums of babies, her applications to the withering face of an aged person, her fumigations for cough, and he is surprised to note how few of the superstitions of her time she allowed herself to endorse. The French MALGAIGNE (37) and the Italian DE RENZI (38) have been her great champions. KOSSMANN (39) praises her perineal operation for complete rupture. PACKARD (40), in his preface to the *Regimen*, says « Most authors hold with DE RENZI that TROTULA was a very real person indeed and worthy of all the posthumous fame she achieved ».

It is hardly necessary now to add that though TROTULA was the most noted woman doctor of the Middle Ages there are many illustrations in the old manuscripts to show that for centuries both men and women practiced medicine when and where they

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Lehrerinnen von Salerno. Sie verfasste ein die ganze Medizin abhandelndes Compendium, von welchem die von den Krankheiten der Frauen handelnden Abschnitte auf uns gekommen sind ».

(34) GEORGE FRIEDRICH HARTMANN, *Die literatur von Früh und hoch Salerno.* 1919.

(35) GEORGE SARTON, loc. cit., vol. II, (Ms.), p. 332-333.

(36) DAREMBERG, *Introduction to the Trad. Meux Saint Marc. École de Salerne,* 1880.

(37) MALGAIGNE, quoted by SPITZNER, p. 39, *loc. cit.*

(38) SALVATORE DE RENZI, *loc. cit.*

(39) KOSSMANN, *Allgem. Gynäkologie,* 1903, quoted by SPITZNER.

(40) FRANCIS R. PACKARD, *Introduction to the translation into English of the School of Salernum,* by Sir JOHN HARRINGTON, 1922.

pleased. Women had authority from ST. JEROME and ST. AUGUSTINE to care for women in labor and for all the sick in times of war and pestilence, which must have been nearly continual. In these pictures it is often difficult to distinguish between men and women by their costumes, at least before women wore the high head-dresses of the fifteenth century. The men are sometimes shown with beards, and sometimes the women wore long veils over their tight hoods. All wore long cloaks, and both men and women are seen bleeding their patients, making acupunctures, dressing wounds, and examining urine. In Codex VIII D. 27, of the Bib. Naz. Napoli, *The Aphorisms of Hippocrates*, (41) is a picture of a medical woman lecturing from a high pulpit to her seated pupils. She wears a long veil and looks quite distinguished. Another illustration shows a woman seated in a garden receiving a flask of urine from a messenger. Still another depicts men and women surgeons trepanning skulls, using the thermo-cautery, setting bones and administering enemas. Which are women doctors and which are nurses can only be inferred.

From a wandering minstrel of the thirteenth century, RUTEBOEUF, we have a famous description of the traditional TROTULA, a beautiful woman wearing a gorgeous robe and long earrings reaching to her shoulders, riding on a gaily caparisoned mule to visit her patients. This corresponds with a picture found in a manuscript by DE RENZI illustrating the birth of the great Norman TANCRED, where, in a large room, richly dressed women were officiating and showing the new baby to his proud mother. They may have been ordinary midwives, but from their velvet robes and important bearing we might rather call them obstetricians.

Thus we may visualize the school of Salerno at the height of its fame when students from all over the world gathered there, speaking many tongues but uniting in Latin to study under men like COPHO and women like TROTULA. Greeks, Jews, Lombards, Normans, and a fair sprinkling of Arabs literally sat at the feet of these teachers and walked with them to visit patients and hence saw as well as heard about the symptoms of their diseases.

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(41) Atlas, PIERO GIACOSA, *Magistri Salernitani*, Plate 2, Turin, 1911; Plate 15, Codex K, IV, 3, Turin. Also Codex 1382, Bib. Casanatense di Roma, *Magister Roland* (the Surgeon).

It was the Arabs, beginning with CONSTANTINUS AFRICANUS (42), who dominated the school after TROTULA's time, but it was her pupils who became the great teachers in other universities and thus drew students away from Salerno. So, it would seem, that there is no need to apologize for TROTULA nor to assume that she was a man who for some whim took her name in order to make her book a first seller, or that she took a man's name for the same reason (43).

From this brief review we have seen that the evidence of the manuscripts and of the printed books of each century has proved that TROTULA was a woman doctor of Salerno of the eleventh century who wrote a famous gynecology which was used for hundreds of years as a text book and work of reference by students and doctors.

(*Haddam, Conn.* Dec. 30, 1929.)

KATE CAMPBELL HURD-MEAD.

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(42) It was been suggested that TROTULA lived in the twelfth century and copied her material verbatim from CONSTANTINUS AFRICANUS. This seems to be quite incorrect and in fact CONSTANTINE most likely copied verbatim from her. SPITZNER also suggests that the famous « mulieres Salernitanae » were all midwives and beauty specialists excepting perhaps TROTULA who was said to be a Magistra. She probably disliked the methods of some of the midwives, their remedies and their charlatanism, as much as we of to-day, and we certainly have no evidence, as SUDHOFF has hinted, that TROTULA had erotic and cosmetic remedies in her sewing basket.

(43) That TROTULA was burdened with names is well shown in this article. She was called Trotula, Tortola, Trocula, Tuenda, Trotta, Trocta, Trota, Trottus, trott', tt', Eros, Erotian, and « one » of the women of Salerno.

Prospectus for a corpus of Medieval Scientific Literature in Latin

The nineteenth century witnessed the publication in various European countries of many great sets of writings and collections of historical sources which have proved of much value to historical scholarship and in the study of past life and thought. But especially since the war, with the economic depression of Europe and increasing costs of production, such undertakings have been noticeably upon the wane, and the few new projects which have been formed have often looked to America for financial assistance. Meanwhile the direction of historical inquiry had been rapidly altering, and new lines of interest were developing for which the essential materials have not yet been made available in printed form and critical editions. Especially is this true for the history of science and of medicine with respect to medieval writings in Latin. Too long have we been dependent for our knowledge of the middle ages upon collections made in the theological or ecclesiastical interest, like MIGNE's *Patrologia* or the *Acta Sanctorum*, or representing the standpoint of the national state and language, like the *Monumenta Germaniae historica* and *Histoire littéraire de la France*. A Corpus of scientific writings is a pressing desideratum. Such an undertaking would appropriately be based upon international cooperation, and only thus could it be assured success.

The present proposal is for a Corpus of medieval scientific writings in Latin. Those in the vernacular languages were usually either derived from Latin works or of minor importance, yet have hitherto been the more accessible. Medieval scientific writings in Arabic are of equal importance with those in Latin but probably can never be recovered in the same quantity. In any case they would properly constitute a distinct Corpus and

undertaking. Ignorance of the medieval contribution and background has long been a weak point of scientists and historians of science, although of late years a number of scholars have been hard at work endeavoring to remedy this defect. The present status of scientific, medical, and surgical works in medieval Latin may be briefly and roughly summarized thus. Many authors and treatises are undoubtedly at present quite unknown but will be turned up sooner or later in manuscript form. A second very large group are known, and some manuscripts of their works have been located and perhaps somewhat studied, but they have never been printed. A third group are in type as incunabula and other early editions which are almost equally rare and inaccessible, especially in America. Moreover, these early editions were often very carelessly printed from a single late and inferior manuscript of the treatise in question, or have taken unwarrantable liberties with the language and perverted the thought of the author. Merely to make them more accessible to readers by reproducing them in facsimile or otherwise, however pleasing it may be from an antiquarian standpoint, would not be at all satisfactory to students of the history of science or of the middle ages. Revised editions of such works must be issued, based upon careful collation with the earliest and best manuscripts. The same need of new critical editions applies also in the case of too many works that have been more recently printed or reprinted, either in the great sets like MIGNE's *Patrologia* or by individual editors. But as these inferior editions are at least accessible, they should perhaps wait for revision until the three preceding groups have been made available. Finally, there are those medieval scientific and medical writings which have been recently and either critically or at least fairly satisfactorily edited, and which there is the least occasion for including at present in such a Corpus. Even they, however, are so scattered about in a variety of publications, some of them having appeared a few pages at a time in non-consecutive numbers of a periodical, that their aggregation in a single collection would certainly be a great convenience. It furthermore will occasionally happen that while some of an author's works have been printed, others are still in manuscript and that it would be desirable to combine them all in a single fresh volume or edition.

It might seem at first glance the most satisfactory arrangement to attempt to include all works of medieval science in Latin and to issue the successive volumes in the chronological order of their authors and composition, beginning from the early middle ages. However ideal this procedure might be, it must be rejected at present as impractical. The high cost of printing and publishing now prevalent, especially in the case of Latin texts, makes it unlikely that so ambitious a project could be financed. Even if it could, the fact that all the authors and treatises are not yet known and that some of those which are known have not yet been dated, makes the observance of such an order impossible for the present. Furthermore, beginning with the earlier authors would not be the most immediately helpful procedure, since as a rule they are the more accessible now (1) and, scientifically, the less important. It would therefore seem advisable to initiate the Corpus by publication of those works which are now inaccessible, for which there is the greatest need, and which scholars are ready to edit.

One also would wish to avoid all appearance of rivalry or interference with existing enterprises and publications which have contributed so much towards increasing our knowledge of medieval science, such as the *Beiträge zur Geschichte der Philosophie*, the *Abhandlungen zur Geschichte der mathematischen Wissenschaften*, *Sudhoffs Archiv für Geschichte der Medizin*, *Bibliotheca Mathematica*, recently resuscitated through the aid of the American Mathematical Society, and the publication by the Clarendon Press under the editorship of ROBERT STEELE of *Opera hactenus inedita Rogeri Baconi*. The Polish Academy has a proposal for publishing the Latin translations of ARISTOTLE which were current and cited in the medieval period. It would be foolish to duplicate what such agencies have already accomplished or to discourage existing enterprise by planning to cover the same ground.

Such considerations will serve to explain why certain authors and treatises are omitted from the ensuing prospectus. There has also been the problem of determining what categories of works to include under the general caption, scientific. Possibly

(1) And that sometimes in critical editions, such as BUBNOV's edition of the *Opera mathematica* of GERBERT, Berlin, 1899, or the *Etymologiae* of ISIDORE OF SEVILLE by M. W. LINDSAY, Oxford, 1911.

medical works should constitute a distinct Corpus, but medicine and natural philosophy were so closely associated in medieval education and universities, and the same writers so often composed treatises of medicine and astronomy or mathematics, that it seems almost unnatural to separate them. Treatises on astronomy, mathematics and music by a single author are another frequent phenomenon, but writings concerning music have been generally omitted. Many are already accessible in COUSSEMAKER's *Scriptorum de musica medii aevi nova series* or in GERBERT's older collection. The accounts of medieval travelers have also been excluded from the present prospectus, valuable as they are for the history of geography, and no attempt has been made to deal with maps and *portolani*.

How far to include the translation of scientific works from Greek, Arabic and Hebrew is another difficult question. To attempt to include all would make the Corpus very voluminous and expensive. Yet these versions were characteristic of their time and differed markedly from later translations, and many of them are essential to have at hand in order to trace references and citations. Nevertheless in the ensuing prospectus most of them are omitted, even unto JACOBUS ANGELUS's translation of the Cosmography of PTOLEMY, and all the translated works of GALEN except the *Ars parva*. But some works like the *Canon* and *Sextus naturalium* or *De anima* of AVICENNA and the Latin DIOSCORIDES were so basic in medieval culture and are so inaccessible now that it seems imperative to include them. This also holds true for works from Greek and Arabic which are extant only in Latin translation. Occult science and astrology have been for the most part omitted, but were so intertwined with the other science of the time that their inclusion to some extent cannot be avoided and should not be, or a false impression would be given of the state of thought.

It will be seen that in the effort to reduce expense the proposed Corpus has been cut down from every side to the very quick, so far as its content is concerned. With respect to style and format, too, it will doubtless be necessary to forego the expensive bindings and the large folio and portly quarto volumes, with their bold type and ample margins, of the great historical sets and collections of days gone by. Such volumes, moreover, are

none too easy to handle, so that a more modest octavo format would actually prove more serviceable. The need for the Latin texts is so urgent that it would seem advisable, while insisting that they be strictly reliable and accurate, to devote the space of the Corpus mainly to the texts themselves rather than to long introductions and an excess of subsidiary apparatus, minor variant readings, and foot-notes. Scholarly Prolegomena might well appear beforehand in the periodicals which would be freed by the Corpus from the burden which they now frequently assume of including new editions of texts. Other scholars would thus be given an opportunity to offer suggestions before the text's appearance.

On the other hand, if this proposed Corpus is to fulfill its purpose, if it is to command the general adherence and loyal support of scholars in this field who are at present editing single texts or extracts from time to time in individual volumes or in periodicals, if it is to induce them to make it henceforth the channel for all such publication on their part, if it is to capture the imagination of the world of learning and take its proper place among historical and scientific collections :—if it is to do these things, then it must be issued in a durable, dignified and attractive form without too close concern as to expense, it must be capably edited, and must draw trained workers and stimulate them to greater activity by providing them with photostats of the necessary manuscripts, defraying their traveling expenses to distant libraries, and offering them something in the way of an honorarium for the arduous and prolonged labor involved in the critical editing of a historical and scientific text.

Some may feel that the time has not yet come for such an enterprise, and that further exploration of the new field and tentative experiments are first necessary. But when one sees how many texts, extracts, and fragments are already appearing in solitary editions, in appendices to general works and monographs, in periodicals, and in doctoral dissertations, one realizes that the need is already pressing for a general repository to combine and render more accessible and uniform future activity of this sort. The task will be a slow and long one. Many years will necessarily elapse before its completion. Perhaps it will still be in process in the year of our Lord 2130, just as the *Acta Sanctorum*,

of which the first volume was published by BOLLANDUS in 1643, is still in process today, while the *Histoire littéraire de la France*, initiated in 1733 by the Congregation of St. Maur, has so far covered only to the fourteenth century. But it is doubtful if we shall hasten the finish by delaying the start.

Below is appended the list of the authors or kinds of works which it seems most imperative to include in such a Corpus. They have been roughly numbered to indicate about how many volumes they might fill. Sometimes one author will make a rather short volume and the next a very long one, but they will probably average up about as indicated. Titles, manuscripts, and old editions have, for the sake of brevity, usually not been listed, but much material of this sort can be supplied, if desired. Suggestions will be welcomed from others as to authors and works which might be added to the prospectus, or substituted for certain names already listed. The ideal of the Corpus may be briefly summarized thus : as a rule no satisfactory and accessible text will be duplicated; nothing previously printed will be republished without critical revision from the manuscripts ; a great body of past thought and writing, rich in significance and illuminating for the development of the human mind and knowledge, will be placed in print for the first time.

ENCYCLOPEDIC WORKS ON NATURE

Number of volumes

1-8 VINCENT OF BEAUVAIS, *Speculum naturale*. It is desirable to republish this great work soon, since of previous editions the inaccessible incunabulum of 1485 in two great folio volumes is alone trustworthy.

9-10 THOMAS OF CANTIMPRÉ, *De natura rerum:* never printed.

11-13 BARTHOLOMEW OF ENGLAND, *De proprietatibus rerum:* old editions scarce and should be revised from Mss.

14-16 DOMINICUS BANDINUS of Arezzo, *Fons memorabilium universi:* or as much of it as can be recovered.

The following works, since they are either mere compilations of facts from nature to be used as the basis of moralizing, or are miscellanies in which facts concerning nature constitute only

a part of the work, may be tentatively omitted from the Corpus, although eventually they also should probably be added as affording light on the general attitude of those times towards nature and science.

PETRUS BERCHORIUS, *Reductorium, Repertorium*, etc.
JACOBUS MAGNUS, *Sopholegium*.
JOHN OF SAN GIMIGNANO, *Summa de exemplis*.
Liber moralitatum rerum naturalium.
Multifarium de diversis.
Pantalogia rerum naturalium: possibly identical with PETRUS A FANO SERVATORIS, *Pantheologia*.
Septiformis de moralitatibus rerum nature.

The treatises that follow, on the other hand, appear to address themselves directly to problems of natural philosophy in a scientific spirit.

17 BATE, HENRI, *Speculum divinorum et quorundam naturalium*.
18 BONETUS, NICOLAUS. *Physica* and *Theologia naturalis*.
19 BURLEY, WALTER, *De principiis naturalibus*.
20 GERARDUS HARDEWICENSIS, *Epitomata totius philosophiae naturalis*, or, *Reparationes Alberti*.
21 HERVAEUS NATALIS, *Natural philosophy*.
22 JAMES OF ALEXANDRIA, *Super totam philosophiam, naturalem et moralem*.
23 IOHANNES DACUS, *Philosophia super omnes scientias*.
24 IOHANNES DE SICCA VILLA, *De principiis naturae*.
25 IOHANNES DE SPERNEGASSE, *Questiones in totam philosophiam naturalem*.
26 NICOLAUS FRANCUS VIMACUUS, *Epitome philosophiae naturalis*.
NICOLAUS DE ORBELLIS, *Cursus librorum philosophie naturalis secundum viam... Scoti*.
27 RICHARD OF LAVENHAM, *Speculum vel philosophia naturalis*.

The following works may be regarded as too late to include in a Corpus of medieval science, although written before 1500: also they were printed in old editions, which, however, are now rather inaccessible.

GEORGE VALLA, *De expetendis et fugiendis rebus*.
HIERONYMUS SAVONAROLA, *Compendium totius philosophiae*.

THEOPHILUS CREMONENSIS DE FERRARIIS, *Propositiones ex omnibus Aristotelis libris.*
JOHANNES PEYLIGK, *Philosophiae naturalis compendium.*
HERMOLAUS BARBARUS, *Compendium scientiae naturalis ex Aristotele.*
LAURENTIUS BONINCONTRI MINIATENSIS, *Rerum naturalium et divinarum.*

AUTHORS IN PARTICULAR FIELDS

Next we turn to more particular fields and divisions of natural science and to individual authors, observing something like chronological order, but reserving astronomy and medicine for later separate treatment.

28 *Early Herbals:* PSEUDO-APULEIUS, MACER, WALAFRID STRABO. L. CHOULANT's ed. MACER FLORIDUS *De viribus herbarum*, of 1832 is rare, not being found in the Harvard library and not being mentioned in SARTON's *Introduction to the History of Science.*

29 DIOSCORIDES, medieval Latin versions of (see my *History of Magic*, I, 604).
AURACHER and STADLER's ed. of the early translation is scattered through 5 vols. of *Rom. Forsch.* Of the later version on which PETER OF ABANO commented there are only old eds.

30 *Later Herbals:* PLATO DE DUISIS, RAYNAUDUS, RINIUS, RUFFINUS, etc.

31 BEDE's writings on nature, with similar or related treatises, require re-editing because expurgated in past editions, as HAURÉAU pointed out. With them in the same volume might be combined their derivatives such as the *Liber Iparchi:* see HASKINS, *Mediaeval Science*, 1924, p. 89.

32 *Treatises on the arts:* Compositiones ad tingenda, Mappe clavicula, THEOPHILUS, HERACLIUS, etc.

33 *Marbod and other Lapidaries.*

34 *Latin translations of* ALKINDI and other Arabic science.

35 The *Pseudo-Aristotle.*

36 Medieval Latin treatises ascribed to PLATO, GALEN, PTOLEMY, etc.

37 *Hermetic books.*

38 *The Pseudo-Geber:* Latin works of alchemy attributed to.

39 ADELARD OF BATH: partly a question of reediting and bringing together, partly of publishing from Mss. for the first time.

It would be a great convenience to bring together his works in one volume. The *Questiones naturales* are found only in rare old editions whose text is faulty and needs revision from the Mss. While some of his mathematical writings have been more recently and critically edited. they are scattered in different collections and periodicals. Other works are still found only in Mss. On the other hand, some of ADELARD's treatises, such as those on the abacus, astrolabe, and falcons, would perhaps more appropriately go into the volumes dealing with those subjects.

40 WILLIAM OF CONCHES and similar works.

A combined new edition of his works is highly desirable, although perhaps others are of more immediate necessity. The old editions of *Philosophia* and *Dragmaticon* were not in his name and further require reediting from the numerous Mss. His Glosses on the *Timaeus* were printed by COUSIN only in part.

Although DANIEL MORLEY wrote half a century later, the similarity of his *De philosophia* to WILLIAM's *Philosophia* suggests combining them in one volume. SUDHOFF's recent edition of DANIEL is somewhat faulty.

AUBERT OF REIMS, *Philosophia*, might be added to the same volume.

41 HERMANN OF CARINTHIA, *De essentiis*, and such works on the universe and elements as are found in Ms. Galba E iv. of the British Museum.

42-43 MICHAEL SCOT, *Liber introductorius* and *Liber particularis*.

44 MICHAEL SCOT, minor works and alchemies ascribed to.

45 *Kiranides* and associated treatises.

46 WITELO, JORDANUS NEMORARIUS, etc.

Almost the only work of ALBERTUS MAGNUS in the field of natural science that has been published in a modern critical edition from manuscripts is the *De animalibus* (a text covering 1598 pages and not wholly free from faults). The remaining scientific writings of ALBERT might be distributed in volumes somewhat as follows:

47-48 *Physics*.

49 *Coelo et mundo.*
50 *Meteoris*, etc.
51 *Mineralibus*, etc.
52 *De generatione et corruptione*, etc.
53 *De anima*, etc.
54 *Secrets* and *alchemical treatises* ascribed to ALBERT.

The remaining authors in this section, mostly of the fourteenth and fifteenth centuries, are arranged alphabetically rather than chronologically.

55 BLASIUS OF PARMA: works in the fields of physics, mathematics, and astronomy (see *Archeion*, 9, 177-190).
56 FONTANA, JOHN: mathematical, mechanical and military works.
57 HENRY OF HESSE: on natural causes and effects, and against astrology.
58 JOHN MICHAEL ALBERT, *De constitutione mundi.*
59 JOHN OF RUPESCISSA: alchemical.
60 KILWARDBY, ROBERT.
61 LUDOVICUS DE ANGULO, *De figura seu imagine mundi.*
62 MARIANUS JACOBUS (TACCOLA), *De machinis libri decem.*
63 MARLIANUS, IOHANNES: physics and mathematics.
64 MARZIO, GALEOTTO: *De homine, De doctrina promiscua, De incognitis vulgo.*
65 NICHOLAS OF CUSA: scientific and mathematical works.
66 ORESME, NICOLAS: physics, mathematics, and astronomy.
67 PAUL OF VENICE.
68 PECKHAM, JOHN.
69 PETRUS CRESCENTIUS, *De agricultura.*
70 ROBERTUS CRICKELADENSIS, *Defloratio Plinii.*
71 SUISETH, RICHARD, *Calculationes.*
72 THEODERICUS SAXO or TEUTONICUS.
73 VALTURIUS, ROBERTUS *De re militari.*

The fourteenth and fifteenth centuries were a time when there was much scientific discussion of such matters as proportion, motion, velocity, the intension and remission of forms, *de maximo et minimo, de instanti, de generatione*. These matters were treated by some of the authors above mentioned. Until such works have been more studied, it is difficult to say whether it would

be better to combine some of them topically or to keep them under their respective authors. Some of these not yet mentioned are :

74 Albert of Saxony.
75 Angelus de Fossanbrono.
76 Bradwardine, Thomas, archbishop of Canterbury.
77 Cajetan de Thienis.
78 Franciscus de Ferrara.
79 Guido de Bononia.
80 Hugh of Siena.
81 James of Forlì.
82 John of Holland.

Scientific conceptions and hypotheses at this time were to a large extent enunciated in commentaries upon the works of Aristotle in natural philosophy, particularly—it would seem—the Physics and *De anima*. The Commentators upon Aristotle therefore, voluminous though they be, cannot be neglected in a Corpus of medieval science, although such particular works as, upon further study, prove relatively jejune and lacking in suggestiveness may be omitted.

85-86 Averroes.
87 Albert of Saxony.
88 Apollinaris de Offredis of Cremona.
89 Boethius Dacus.
90 Buridan, Jean.
91 Burley, Walter.
92 Cajetan de Thienis.
93 Dominicus de Clavasio.
94 Franciscus de Mayronis.
95 Gratiadei of Ascoli.
96 Gregory of Norbury.
97 James of Sicily.
98 John Canonicus.
99 John Didneshen, Disnehale, Dymsdale, or Tydenshale.
100 John de Chymiacho.
John of Jandun.
101 John Marbres Catalanus.
102 John Marchanova.
103 John of Orléans.

104 JOHN SCHARPE.
105 LONDORIUS.
106 PETRUS TRAPOLINUS.
107 NICCOLÒ DA FOLIGNO.
108 RICHARD OF LAVENHAM.
109 RUDIGERUS DE ROERMUNDIA.
110 SIMON OF FEVERSHAM.
111 THADEUS OF PARMA.
112 THEMON JUDAEUS.
113 THOMAS DE WILLETONA.
114 VERSORIS, PETRUS DE.

Various anonymous treatises exist under the three following heads, but three volumes would certainly not suffice for them :

115 Nature : questions and *Summae* concerning.
116 Philosophy.
117 Physics.

A number of brief treatises by named authors as well as other anonymous writings might be grouped under these captions :

118 Agriculture and Plantations : PSEUDO-ALBERT, NICOLAUS BOLARDUS, TANAGLA, etc.
119 Colors : JOHN OF BOLOGNA, PETRUS S. AUDEMAR, etc.
120 Experimenta : BENJAMIN JUDAEUS, CONRAD HILDENSER, EGIDIUS CANCELLARIUS, NICOLAUS, NICHOLAS OF POLAND, JOHN DE S. EGIDIO, LUCAS DE MALLYNG, *Portior medicinarum*, *Secretum philosophorum*, UBERTINUS, VIDIDENUS, etc.
121 Waters, medicinal, chemical, etc. : ALBERTUS DE ALAMANNIA, ALPHEUS, BISTICCIUS, JOHN nephew of BONIFACE VIII, FRANCISCUS DE PERUSA, JOHN GALLACIUS, etc.

Even after the above inclusions a large amount of alchemical literature would be left to be sifted and embodied or rejected. Until alchemical works have been better identified, it is risky to hazard a classification, but tentatively may be suggested :

122 Alchemical tracts ascribed to ARNALD OF VILLANOVA and RAYMOND LULLY.
123 BERNARD OF TREVES, THOMAS OF BOLOGNA, etc.
124 Writings of English alchemists.
125-126 Other alchemical tracts.

ASTRONOMY

By omitting the vast literature of judicial astrology—which however, should in time have a Corpus of its own printed—and most arithmetics, geometries, and other mathematical works not related to physics and astronomy, the number of volumes in the astronomical section of the Corpus could be kept within reasonable limits.

127 Calendars.
128 Computi.
129 Almanachs.
130 Astronomical Tables and Canons.
131 Treatises on the astrolabe.
132 Treatises on other astronomical instruments, as *Horologium viatoris*, JOHN DE DONDIS *Opus planetarii*, FRANCO DE POLONIA TURKETUS, JOHN DE LOCRON *Solitarium*, JOHN OF MONTPELLIER on the old quadrant, RUDOLPH OF BRUGES, etc.
133 NIMROD the astronomer and other astronomical treatises before the translations from the Arabic.
134 Works of the twelfth century such as those of WALCHER, PEDRO ALFONSO, RAYMOND OF MARSEILLES, the 25 chapters in Ms. BN 15015, fols. 200-233v.
135 Comets and meteors.
136 Treatises on the motion of the eighth sphere.
137 Theory of the Planets: CAMPANUS, PETRUS DE MUTINA, etc.
138 Sphere of SACROBOSCO and commentaries upon it.

The astronomical and mathematical works of:

139 ABANO, PETER OF.
140 ALFONSO THE WISE.
141 ALLIACO, PETRUS DE.
142 ANSELMIS, GEORGIUS DE.
143 BASINIUS OF PARMA.
144 BERNARD OF VERDUN.
145 BIANCHINI, GIOVANNI.
146 COLLEMAN, JOHN.
147 DAGOMARI, PAOLO.
148 FUSORIS, JEAN.
149 JOHN OF SAXONY.
150 LEO DE BALNEOLIS.

151 LINERIIS, IOHANNES DE.
152 LORENZO LORENZI.
153 MAUDITH, JOHN.
154 MURIS, IOHANNES DE.
155 PAUL OF MIDDELBURG.
156 PEURBACH and REGIOMONTANUS.
157 PROFACIUS JUDAEUS.
158 PROSDOCIMO DE' BELDOMANDI.
159 RICHARD OF WALLINGFORD.
160 TOLHOPF, JOHN: WILLIAM OF WORCESTER.
161-163 GERARD OF CREMONA's translation of the Almagest of PTOLEMY.
164 BASEL. IOH. Commentary on the Almagest.

MEDICINE

If medical works were to be included in the Corpus of Medieval Latin Scientific Literature, the following subjects and authors would be among those to which attention should first be turned. Authors available in modern editions such as NEMESIUS and ALDOBRANDIN OF SIENA, and those published by PAGEL or PANSIER, or found in the collections of DE RENZI, GIACOSA, and SIGERIST's *Texte zur frühmittelalterlichen Rezeptliteratur*, are not included here. A distribution in volumes is roughly suggested.

1-4 The *Canon* of AVICENNA in the medieval Latin translation, containing approximately a million words. The most inclusive and influential single work of medieval medicine. The old editions are inaccessible.
5-7 ORIBASIUS in early medieval translation.
8 ALEXANDER OF TRALLES in early medieval Latin translation.
9 The group of treatises consisting of the *Isagoge* of JOHANNITIUS, *Aphorisms and Prognostics* of HIPPOCRATES, PHILARETUS *de pulsibus*, THEOPHILUS *de urinis*, *Tegni* or *Ars parva* of GALEN.
10 Anonymous tracts and miscellanies found in early Mss. (up to the 12th century) and which do not fall under any of the later subject groupings.
11-13 Medieval Latin translations of RASIS.
14-16 CONSTANTINUS AFRICANUS, original works and translations.
17 GILBERT OF ENGLAND.
18-19 PETRUS HISPANUS.
20 BERNARD GORDON.
21-22 ARNALD OF VILLANOVA.

23-25 Peter of Abano.
26 Albicus, archbishop of Prag.
27 Antonius de Parma.
Bagellardus, Paul.
28 Bartholomew of Brescia.
29 Benivieni, Antonio.
30 Bertrucci, Niccolò.
31 Dondis, Jacobus de.
32 Ferrari de Gradi, Matteo.
33 Gaddesden, John of.
34 Galvanus de Levanto.
35 Garbo, Dino del.
36 Garbo, Tommaso del.
37 Gariopontus.
38 Gentile da Foligno.
39 Gerardus de Solo, of Bourges.
40 Giles de Corbeil.
41 Guaynerius, Antonius.
42 Guido of Forlì.
43 Honestis, Christophorus de.
44 Hugh of Siena.
Jacobus de Partibus.
45 Jacobus de Capellutis of Parma.
46 James of Forlì.
47 Iohannes Calora of Modena.
Iohannes de Concoreggio.
Iohannes de Corpo.
48 John of Parma.
49 John of St. Paul.
50 John of Tornamira.
51 Magorinus.
(Niccolo Falcucci of Florence: his enormous medical compilation, which would easily fill a dozen volumes, seems hardly worth the expense of reprinting from the old editions of 1484 etc., since it is largely unoriginal).
52 Jordanus di Turre.
53 Peter of Tossignano.
54 Petrus de Ybernia.
Richard of England.
55 Sancta Sophia family: Giovanni, Galeazzo, Marsiglio, etc.
56 Savonarola, Michael.

57 SCARPARIA, ANTONIUS.
58 SIGISMUNDUS DE POLCASTRIS,
59 SILLANUS DE NIGRIS,
60 SILVATICUS, MATTHIAS.
61 SIMON CORDO OF GENOA.
62 *Tacuinum sanitatis.*
63 THADDEUS OF FLORENCE.
64 TORNIUS, BERNARD.
65 URSO and URSUS.
66 VALESCUS DE TARANTA.
67 WILLIAM OF VARIGNANA.
68 TORRIGIANO DE' TORRIGIANI, PIETRO.

Other treatises, especially anonymous works, might be grouped in the following volumes devoted to certain subjects or phases of medicine.

69 *Anatomy.*
70 *Antidotaria and Receptae:* NICOLAUS and his commentators, ARNULF OF FLANDERS, GORGI DE FLORENTIA, PLATEARIUS, etc.
71 *Astrological medicine* and *Bleeding* or *Phlebotomy:* a few specimen treatises such as those of ANDALÒ DI NEGRO, JOHN OF AQUILA, JOHN GANIVET, NICOLAUS DE PAGANICA, LEONARDUS QUALEA.
72 *De conservatione sanitatis:* treatises of BENEDICTUS REGUARDATUS, JACOBUS TOLOSANUS, JOHN OF TOLEDO, PHILIP, etc.
73 *Consilia:* ACHILLES GASSARI, ADAE DE RADINGES, BARTHOLOMEW DE MONTAGNANA, MARSILIUS DE SANCTA SOPHIA, FRACINUS, etc.
74 *Critical days:* ALVARUS HISPANUS, AMICUS DE SULMONA, BARTHOLOMEW *de crisi et criticis diebus*, HUGO DE CIVITATE CASTELLIS.
75 *Fevers:* ANTONIUS MALGLANI de Chesio, FERRARIUS, JOHN OF CONCOREGGIO, PETRUS ALBI of Montpellier, PHILO SEPTIMIUS, etc.
76 *Gout, Pains in Joints, Rheumatism:* JAMES OF COBLENTZ, THOMAS OF NEWMARKET, etc.
77 *Poisons:* MAIMONIDES, PETER OF ABANO, WILLIAM DE MARRA, FRANCIS OF SIENA, CHRISTOPHER DE HONESTIS, JOHN OF AREZZO, etc.
78 *Practica:* BERNARD ALBERT, JOHN JACOBI, ROGER DE BARON, WILLIAM OF BRESCIA, etc.

79-82 *Surgery:* PETRUS DE ARGELLATA, BONGIOANNI DALL' ORTO, JOHN OF MILAN, LEONARD OF BERTIPAGLIA, MILO, PHILO OF PARIS, RAYMUNDUS, ROGER OF PARMA, THEODORIC OF CERVIA, WILLIAM OF SALICETO, etc.

83 *Urinoscopy:* WILLIAM OF ENGLAND, WALTER AGILON, ALBERT OF MONTPELLIER, BARTOLUS, HENRY DANIEL, FERNANDUS DE CORDOVA, etc.

84 *Veterinary:* JORDANUS RUFUS of Calabria, JACOBUS AURIA, LAURENTIUS RUZIUS, THEODORICUS BURGUNDIONIUS of Lucca, THEODORIC OF CERVIA, etc.

85 *Pest tracts:* although many have been recently published, others remain in manuscript form as yet.

New York City. LYNN THORNDIKE.

Horologium Viatorum

Anmerkungen zu den Mitteilungen von Herrn L. THORNDIKE *in « Isis » Bd.* 13, *S.* 51-93, 1929

Über die von Herrn THORNDIKE erwähnte Zylinder-oder Säulchensonnenuhr gibt es auch in den deutschen Bibliotheken verschiedene Handschriften. Gemäss meinem Handschriftenverzeichnis (*Verzeichnis der astronomischen Handschriften des deutschen Kulturgebietes*, München 1925; *Isis*, 8, 801) beziehen sich allein die Nummern 4198-4207 auf die Abhandlung HERMANNS DES LAHMEN, die mit den Worten : « Componitur quodam simplex et parvulum viatoribus horologicum instrumentum » beginnt. Diese Abhandlung ist vermutlich gemäss einem arabischen Vorbilde entstanden. Von HERMANN selbst stammt die Tafel der Sonnenhöhen für den Anfang und die Mitte jedes Monates. Diese Tafel, die sogar die Höhen bis auf einen halben Grad angibt, wurde von ihm auf Grund von Beobachtungen mit dem Astrolab für die Breite von 48° entworfen. Die Sonnenuhr gilt infolgedessen nur für diese Breite. Eine Figur der Sonnenuhr ist dieser Abhandlung nicht beigegeben, sondern nur die Hilfsfigur eines Quadranten. Dagegen stammt die älteste Figur einer solchen Sonnenuhr von BERENGAR im XI. oder XII. Jahrhundert (Nr. 1240 meines Verzeichnisses). Im XIII. Jahrhundert verfasste ROBERT GROSSETESTE eine mit den Worten « Investigantibus chilindri dispositionem » beginnende Abhandlung, die als Neuerung Tafeln für Oxford, London und Rom enthält (Nr. 3841-3852 meines Verzeichnisses). Im XIV. Jahrhundert begegnen uns verschiedene Abhandlungen, die teils auf HERMANN, teils auf GROSSETESTE zurückgehen. Den Höhepunkt erreicht die Entwicklung dieser Art von Sonnenuhren im XV. Jahrhundert und zwar an der Wiener Universität. JOHANN VON GMUNDEN schuf im Jahre 1430 eine Abhandlung, die mit den Worten « Tractatus kilindri duas

habet partes » beginnt und eine Tafel für Wien bringt (Nr. 3536 meines Verzeichnisses). Daraufhin entwarf GEORG VON NEUBURG um 1432 mehrere Tafeln und JOHANN SCHINDEL im Jahre 1433 eine mit den Worten « Chilindrum quod et horologium viatorum dicitur » beginnende Abhandlung (Nr. 9418-9421 meines Verzeichnisses). Auch GEORG PEUERBACH, der Nachfolger GMUNDENS als Professor an der Wiener Universität, verfasste im Jahre 1463 eine Abhandlung über diese Art von Sonnenuhren. Vermutlich ist die von Herrn THORNDIKE erwähnte Erfurter Abhandlung, die sich in Vatic. Palat. lat. 134 befindet, eine Weiterführung der Wiener Gedanken. Im XVI. und XVII. Jahrhundert kommen noch verschiedene Abhandlungen über diese Sonnenuhren vor, wie die betreffenden Nummern meines Verzeichnisses beweisen; doch hatte diese Art der Sonnenuhr wegen ihrer grösseren Ungenauigkeit keinen Bestand; im XVIII. Jahrhundert erlischt sie. Sie diente immer nur zur rohen Zeiteinteilung, aber wegen der mangelhaften Befestigung des schattenwerfenden Stiftes nicht zur Breitenbestimmung.

Die älteste erhaltene Zylindersonnenuhr ist die im Nationalmuseum zu München befindliche Sonnenuhr von 1455 aus Elfenbein, abgebildet in BASSERMANN-JORDAN, Uhren, S. 38.

Die von Herrn THORNDIKE begonnene Durchsicht der Vatikanischen Handschriften auf solche Werke, die für die Geschichte der Naturwissenschaften und Medizin wichtig sind, ist sehr zu begrüssen und findet hoffentlich eine baldige Fortsetzung. Bei dieser Gelegenheit möchte ich erwähnen das Verzeichnis astrologischer und mythologischer illustrierter Handschriften des lateinischen Mittelalters in römischen Bibliotheken (*Sitzungsberichte der Heidelberger Akademie der Wissenschaften, Philos. historische Klasse*, Jahrgang 1915, 6-7. Abhandlung; *Isis*, 5, 277) von FRITZ SAXL das eine ausführliche Beschreibung solcher Hansdchriften mit guten Abbildungen und mit Verzeichnissen der Personen, Schreiber und Eingangsworte gibt. Eine systematische Ausdehnung der Untersuchungen von THORNDIKE und SAXL auf sämtliche italienische Bibliotheken wird noch viel Unbekanntes ans Licht bringen. Hat doch meine Durchsicht der deutschen Bibliotheken mehr als 12.000 für die Geschichte der Astronomie wichtige Nummern ergeben ! Erst die systematische und vollständige Durchsicht der Bibliotheken der wichtigsten Kulturländer

kann uns die unentbehrliche Grundlage für erfolgreiche geschichtliche Untersuchungen liefern.

Bezüglich der auf S. 88 erwähnten Werke des JOHN HOLYWOOD lässt sich noch eine Ergänzung bringen. Es finden sich von ihm noch folgende Werke: ein Sternverzeichnis für 1246, ein Werk über das Astrolab, ein Werk über die Planetentheorie und ein Werk über den Quadranten, das vielleicht mit THORNDIKES Nr. 93 identisch ist.

Remeis-Sternwarte
Bamberg

ERNST ZINNER.

Some Notes on Indian Astronomy

The basis of Hindu Astronomy lay in the religious aspirations of Hindu votaries when each heavenly body represented a Divinity. The study of Astronomy originated in the doctrine that the Supreme Being had assigned duties to each of the heavenly bodies, by which they became rulers of the affairs of the world, and that a knowledge of the Divine Will would be required by watching and observing the order of their motions and the recurrence of times and seasons. With the Hindus the study of Astronomy became a sacred duty, at least among the most educated classes, inasmuch as the celestial bodies were viewed as gods and the worship of them was enjoined by the Vedas. Thus the piety of the Hindus in primitive ages led them to watch with care all the phenomena of the heaven and to perfect their calendar of festivals, etc. To this end the first Hindu astronomers directed their attention.

According to BAILLY, accurate astronomical observations had been made in India, probably, before 3000 B. C.—a conclusion which is justified on independent evidence. Some writers of the history of the Vedic age have also held that the Vedic sacrificial rites had a close connection with astronomical calculations. In any case as they were regulated by the position of the moon with reference to the stars, they must be held to presuppose accurate astronomical observations, which indeed have come to be a religious ncessity; it is therefore reasonable to argue, a priori, that an extensive astronomical knowledge was obtained in India even in the Vedic times. According to the interpretation given to some Vedic hymns by PANDIT SATYAVRATA SÂMAS'RAMI, the Hindus had even in the Vedic times a knowledge of the motions of the planets (at least of five) and the causes of the solar and lunar eclipses. An astronomical interpretation of the Vedic hymns attempted by other scholars goes to show that a knowledge of

solstitial and equinoctial points on the part of the Vedic writers could be reasonably accepted.

Mr. WEBER suggests that MAYA (as mentioned in *Sûryasiddhânta*) is the Sanskrit translation of PTOLEMY of the Greeks and thereby hints at the indebtedness of Hindu Astronomy to the Greeks. We shall presently show how groundless this assumption is. The name of MAYA appears in many places in the *Purâṇas* as a famous architect; and there is a frequent mention of MÂYÂVI-MAYA (by this probably an eminent astrologer and astronomer is meant) in the *Râmâyaṇa* and the *Mahâbhârata*. Apart from the above, granting that MAYA of the *Sûryasiddhânta* is the Sanskrit counterpart of PTOLEMY, we find that there is not a single passage in the whole of the *Sûryasiddhânta* to show that MAYA gave any lessons on astronomy. He was only a learner and SÛRYA is the preceptor. SÛRYA is of course the god of the Hindus and was not imported from Greece. Therefore, even taking for granted Mr. WEBER's interpretation, we draw just a contrary inference, viz., that MAYA got his teaching from SÛRYA. Again the suggestion of Mr. KAYE that by ASURA MAYA is meant the Zoroastrian AHURA MAZDA needs no refutation; for the mere perusal of any Persian treatise will convince any one that Persian Astronomy was not half so advanced as the astronomical knowledge evidenced in the *Sûryasiddhânta*.

Of all the *Siddhântas*, none were held in such high esteem as the Brahma, Saura, Soma and Bṛhaspati. They were considered to be inspired. There were also two other *Siddhântas*, Romaka and Paulis'a. Mr. KAYE says that both of them are of Greek origin and have much influenced the ancient Hindu astronomers. The *Romakasiddhânta* is undoubtedly a translation of some Greek or Roman treatise as its name suggests. Its method of procedure also does not agree with that followed in any of the above *Siddhântas* and in this treatise the latitude of Alexandria has been adopted for calculating times and dates. Most probably it is an adaptation from PTOLEMY's work, and its calculations have not been used, not even mentioned, in any of the known treatises of Hindu astronomy. The date of its composition has been placed by Dr. KERN in the sixteenth century, for in it there is an occasional mention of the name of Emperor BABAR. Hence we may safely conclude that *Romakasiddhânta* has very little to do with the

progress of astronomical knowledge of the Hindus. Of the *Paulis'asiddhânta* we cannot say the same thing. Its method of procedure agrees in many respects with that of the current *Siddhântas* of the Hindus, the only difference being that the calculation of the solar and the lunar eclipses given in this book are not so accurate as those propounded in the *Sûryasiddhânta* or *Siddhântas'iromaṇi* of BHÂSKARA. It is believed by many European scholars that the *Paulis'asiddhânta* is an adaptation of a treatise by PAULUS ALEXANDRINUS. But there was also a sage in India by the name of PULIS'A. Is it not a faulty argument to base a conclusion on the similarity of names? "We have no right whatever", says Dr. KERN in his preface to *Bṛhatsamhitā*, "to infer that PAULUS ALEXANDRINUS and PAULIS'A are one and the same, for identity of name is too slender a ground, especially when the name happens to be a common one". Further, the *Paulis'asiddhânta* is an astronomical treatise based on mathematical calculations, whereas the work of PAULUS is mainly an astrological one. We have, however, every reason to believe that the *Paulis'asiddhânta* had its origin in India and was not imported from outside.

The second period of Hindu Astronomy beginning with ÂRYABHAṬA was a real advance in mathematical astronomy and the reasoning set forth there exhibits a keenness of observation that would do credit to latter-day European philosophy. The birth of ÂRYABHAṬA marked a new era in the progress of mathematical astronomy. He wrote a number of works on astronomy which are now mainly known by his own work called Âryabhatîya and through quotations from his writings given by BRAHMAGUPTA and other subsequent astronomers. It is, in general, through these citations that ÂRYABHAṬA was known to be an eminent astronomer anterior to BRAHMAGUPTA and living in the latter part of the fifth century. From the quotations of BRAHMAGUPTA we learn that ÂRYABHAṬA believed in the diurnal motion of the earth round its axis. "The starry sphere", he affirms, "is stationary, and the earth making a revolution produces the daily rising and setting of stars and planets." The idea of heliacal risings and settings of stars and planets was first fully developed in Europe by COPERNICUS in the 16th century, and before him it was not recognised though some rudimentary hints

were thrown by PYTHAGORAS in the 6th century B. C. ÂRYABHAṬA promulgated the above theory in the 6th century P. C. at the latest. Hence we see that Mr. KAYE's statement that the Hindus borrowed the idea of heliacal risings and settings of stars and planets from the Greeks does not stand scrutiny. We are rather inclined to believe that this theory had its origin in India and was introduced in Europe through the Greek medium, by which it was given its present practical garb. The confusion as regards the correct date of ÂRYABHAṬA arises from the fact that most of the oriental scholars have failed to notice that there were two men of the name of ÂRYABHAṬA — one, the great astronomer who was born in 476 A. C. and the other, a mere commentator and compiler who flourished in the tenth century A. C. The latter wrote a commentary on the *Sûryasiddhânta*. Dr. BHAU DAJI says that the work mentioned by ALBERUNI as written by ÂRYABHAṬA is this commentary. If this be true we can infer that the *Sûryasiddhânta* in its present form was current before the ninth century; but we have evidence enough to show that some portions of the *Sûryasiddhânta* were written even much earlier.

Next came VARÂHAMIHIRA who also lived in the 6th century. He was not an original writer but a compiler. One of the passages in his work, *Bṛhatsamhitâ*, has led Mr. KAYE to think that VARÂHA admits that the Hindus have borrowed much from the Greeks. We shall presently show that he has misunderstood and misinterpreted the couplet referred to. He translates the couplet thus—" The Greeks, indeed, are foreigners, but with them this science is in a flourishing state. Hence they are honoured as if they are ṛṣis ". The couplet as written by VARÂHA is this :

Mlecchā hi yavanās teṣu samyak s'âstram idaṃ sthitaṃ
Ṛṣivat te' pi pûjyante kiṃ punar daivavid dvijah.

The translation should be as follows : " The Greeks are foreigners, with them also this science is in a flourishing state. Even they are honoured as Ṛṣis; much more will be honoured a Brāhmin versed in astrology ". Scholars without sufficient knowledge of Sanskrit are likely to advance this couplet as a proof that the Hindus learned astronomy from the Yavanas (Greeks) but one should not fail to take notice of the fact that the above couplet occurs in the astrological section of *Bṛhatsamhitâ*

and also in connection with the word " Daivavid " meaning astrologer and not astronomer. From the *Bṛhatsamhitâ* edited and translated by PANDIT SUDHAKAR DVIVEDI we find that the names of Yavana (Greek) teachers occur sixteen times and everytime in support of the views of VARÂHA as regards " lagnas'uddhi " and " vāras'uddhi " and at no time in support of astronomical facts.

The name of BRAHMAGUPTA is held in high esteem by all Hindu writers. He was born in 598 A. C. We know that there is not a single argument in the whole range of early Greek Astronomy to prove why the earth, though spherical, appears flat to observers on earth. " The earth " says BRAHMAGUPTA, " stands firm by its own power without any other support in space. If there be a material support to the earth and another upholder of that and again another of this and so on without limit, and if finally self-support must be assumed, why not assume it in the first instance? Why not recognise it in this multiform earth? The earth possessing an attractive force draws towards itself any heavy substance situated in the surrounding atmosphere, and that substance appears as if it fell (like a stone). But whither can the earth fall in ethereal space which is equal and alike on every side?... If the earth were falling, an arrow shot into the air would not return to it when the projectile force was expended, since both would descend; nor can it be said that the earth moves slower and is overtaken by the arrow, for heaviest bodies fall quickest and the earth is the heaviest ". Such reasonings can do credit even to modern astronomers.

Again why does not the earth appear spherical to men on earth? ÂRYABHAṬA in reply says :

" As the earth is a large body, and a man is exceedingly small, the whole visible portion of the earth consequently appears to a man on its surface to be perfectly plane ". We think this is a point gained by Hindu Astronomy over the Greek.

The next point that engages our attention is the explanation for the planetary motions by the method of epicycles. Mr. KAYE argues that this was of Greek origin and the Hindus borrowed it from the Greeks. The first notion of the planetary motion was clearly stated in the first chapter of *Sûryasiddhânta*, and this, we are led to believe from the citations of ancient astronomers,

existed in the oldest edition of *Sûryasiddhânta* the date of which can be placed somewhere near the second or third century

" The planets in their orbits go rapidly and continually with the stars towards the west, and hang down at an equal distance as if overpowered (over-matched in speed) by the stars. Therefore, the motions of the planets appear towards the east, and their daily motions, determined by their revolutions, are unequal to each other in consequence of the circumferences of their orbits; and by this unequal motion they pass the sign. The planet which moves rapidly requires a short time to pass the signs and the planet that moves slowly passed the sign in a long time » (*Sûryasiddhânta*, chap. I, slokas 25-27).

This notion that the motion of all the planets was caused by a velocity in their orbits, which was the same for all alike, was prevalent not only in India but also in Europe even to the times of KEPLER and NEWTON. This is evident from the manner in which KEPLER combated this doctrine and from the important use he made of it. Soon after the death of TYCHO, KEPLER " made many discoveries from TYCHO's observations. He found that astronomers had erred from the beginning of the science in ascribing circular orbits to the planets. He easily saw that the higher planets not only moved in greater circles but also more slowly than nearer ones, so that on a double account their periodic times were greater ".

This planetary motion the Hindus and the Greeks explained by means of epicycles. ÂRYABHAṬA, who is believed to be the father of Indian epicycles, ascribed to the epicycles by which motion of a planet was represented a form varying from the circle nearly to an ellipse. It was wellknown to the Hindus that a supposed uniform motion in a circle about the earth did not really represent true motion in its orbits, although the hypothesis served sufficiently to determine the mean motions and the mean place of a planet when deduced from observations carried on for lengthened periods. They knew that every planet in its course was subject to great irregularities, the motion undergoing continual changes. At one time it would be direct towards the east until the planet reached a stationary point where it would seem to be at rest; then a retrogade motion would begin and continue for a time till another stationary point was reached,

and the eastward motion was repeated. It was to account for these irregularities that the epicycle was invented. By the Greeks this contrivance was ascribed to APOLLONIUS. He conceived that a planet in its course, described with uniform motion the circumference of a circle, called the epicycle, whose centre moved uniformly in the circumference of another circle, called the deferent, the centre of which is the centre of the earth. It was also supposed that, whilst the centre of the epicycle was moving eastward in the direction of the signs, the planet itself was moving in a direction opposite to that of the sign. By this hypothesis it was easy to show the various changes in the motion of the planets. This theory was generally adopted by western nations with the addition of other epicycles, introduced by PTOLEMY, necessary for expressing the apparent motions with accuracy. But the Hindus had two different methods for calculating the true place of a planet from its " mean place " as determined by the rules of *Siddhântas'iromaṇi* (chap. II). One of these methods resembled that of APOLLONIUS, but there was also considerable difference, viz., that whilst the planet moved uniformly in its epicycle, whose centre moved in the deferent concentric with the earth, the epicycle itself was conceived to be variable, the circumference being the greatest when the planet was in an apis (at apogee or perigee, the true and mean places being then coincident), and the least when the planet was at a distance of 90 degrees from the points. The other method supposes that, while the mean place of a planet is a point moving uniformly eastward round the circumference of an equal but eccentric circle whose centre is situated in the line joining the apogee with the centre of the earth, the distance from it is the eccentricity. These two methods of calculation, whether by assuming the motions as being in an eccentric or in an epicycle, give exactly the same results. The theories of epicyclical and eccentric motion of planets are beautifully put in the second chapter of *Sûryasiddhânta* and the fifth chapter of *Siddhântas'iromaṇi*. Unlike the epicycles of PTOLEMY and other Greek astronomers, the Indian epicycles had a variable circumference, that of the first epicycle being the largest at apogee and perigee, varying from those points through the deferent to its places at the quadrants, where its circumferences were the least.

Next in importance comes the question of discovery of the twelve signs of the Zodiac. Mr. KAYE has taken it for granted, a priori, that the division originated in Greece and thence was borrowed by the Hindu astronomers. We shall show that the astronomical arguments lead to the very opposite conclusion. The Hindu astronomers had two systems of reckoning: the lunar mansions or the *Tithis* and the signs of the Zodiac or the *Râs'is*, the first being obviously the earlier of the two. For, while the moon's motion among the stars is a matter of direct observation, the solar motion in its relation to the stars could only be observed by an indirect method, on account of the fact that his light shuts out of view all stars in his neighbourhood. On the other hand, the moon's motion is much more irregular than that of the sun. The observation of the sun's motion, therefore, came gradually to be recognised as a matter of practical as well as of scientific importance and the method of signs or *Râs'is* ultimately superseded that of the *Tithis*. As to the lunar system of the Hindus, its high antiquity is testified to by the fact that the primitive series opened with Kṛttikâ (the Pleiades) as the sign of the vernal equinox. But this arrangement would be correct only about 2300 B. C. and nowhere else would be found a well-authenticated Zodiacal sequence of so early a date. If this be granted, it seems to be very probable that the method of signs was evolved in India, for the method of *tithis* which is admitted to be peculiar in India may be regarded as the parent of the method of signs, and we are thus almost able to trace a gradual evolution along lines well-recognized by the science of the system of signs. The Hindu astronomer divided the Ecliptic and the Zodiac into 28 parts (and then into 27) forming so many groups of stars in the path of the moon, each division corresponding with the space of the moon's daily motion through them. The groups are consequently called lunar asterisms. The ancient Hindu astronomers chose a set of 27 principal stars, one for each of the 27 lunar constellations, in general the brightest star of the asterism, and called it Yoga-târâ, whilst the asterism-cluster was named the Nakṣatra. The Yoga-târâ was connected with the beginning or first point on the ecliptic of the division, representing the space of the asterism of the small arc of apparent difference of longitude between them, this arc being called the

Bhoga of the asterism. Thus the 27 divisions of the ecliptic became as fixed in position as the stars themselves, like a great fixed dial, with the numbers ranging not along the Equator but along the Ecliptic itself.

From the above arguments, we deduce that the Hindus founded their lunar mansions which the Arabs (by the name of Manzil) and the Chinese (by the name of Sieu) borrowed. We also know that the Greeks were not possessed of the system of lunar mansions. Prof. WEBER, however, propounded the view that the system originated in Babylon. Such a view can no longer be maintained, since we have now to admit that the Babylonian system is based on the sun's motions. Now if the view advocated above that the lunar system must be of older date than that which is based on the sun's motions be correct we must admit that the Babylonian system must needs have been derived by adoption. Hence we are justified in inferring that if the Hindus can claim to be the originators of the system of lunar mansions, they have an equal right to claim to be the propounders of the system dependent on the division of the Zodiac.

The next point that engages our attention is the question of parallax. Mr. KAYE says that the idea of parallax in Hindu astronomy is also borrowed from the Greeks. We are not prepared to accept his theory which is not supported by reasons. The Hindus, we know, were at a very early date well-acquainted with all facts relating to eclipses. They had rules for calculating the various phases of both the lunar and solar eclipses, i.e., the times of their beginning, middle and end which are set forth in the various astronomical works. The correction of parallax in latitude and longitude is of great importance in calculating eclipses accurately. Hence we are led to believe that the Hindus had a thorough knowledge of this phenomenon even in the Vedic ages when eclipses were calculated for religious purposes. BHÂSKARA in his *Siddhântas'iromaṇi* quoted several couplets from ancient astronomers explaining the importance of the correction of parallax in calculating eclipses. VARÂHAMIHIRA in his *Pancasiddhântikâ* also elaborately deals with it under the section of *Sûryasiddhânta*.

In the ancient times when perfect instruments had not been invented, it was a most remarkable achievement for Hindu astronomers to have determined the lunar and solar eclipses with great

accuracy. The Hindus were at a very early date well acquainted with the facts of the eclipses. They had rules for calculation of the various phases both of lunar and solar eclipses, the times of beginning, middle and end; and notwithstanding the fact that the superstitions of the people in general had greatly deferred the progress of astronomical investigations in early times, the cause of the eclipses was well understood by the Hindu astronomers.

The fixing of the first point of the Indian Zodiac so as to make it unchanged in after time is characterised as a remarkable event in the history of Hindu astronomy and is one of the fundamental differences of the Hindu and the European systems. In the European astronomy all longitudes are measured by arcs of the ecliptic, whose origin is the equinoctial point at the time of observation. This point moves backward along the ecliptic at an annual rate of about 50″ causing an annual change of the same amount in the longitude of the stars and this is termed the precession of the equinoctial point. Hindu astronomy, however, avoided the annual change of longitude by assuming a fixed point of the ecliptic as the beginning of their system, the position of the lunar asterism being fixed in relation to that beginning. The Hindu astronomers were at a very early date acquainted with the phenomenon of precession. Even the theory of the libration of the equinoxes was early known to them. BHÂSKARA says,—" The intersection of the equinoctial and ecliptic circles is the Krântipâta or intersecting point of the sun's path. Its revolutions are retrograde, three myriads in a Kalpa ". A corresponding passage occurs in the *Sûryasiddhânta*,—" The circle of Asterisms moves eastward 30 score (or 600 times) in a Yuga that is to say all the asterisms at first move westward 27″, then returning from that limit they reach their former places, then they move eastward the same number of degrees and returning thence come to their own places. Thus they complete one libration or one revolution as it is called. In this way the number of revolutions in a Yuga is 600, which answers to 600,000 in a Kalpa " (Vapudeva Sastri).

We shall now return to our discussion of the Zodiacal system. In modern times, with our fixed observatories, our instruments of precision, clocks etc., it is rather an easy affair to determine the position of the sun or any other celestial body, at any time. We have in fact only to note the moment of the transit of the

body across the meridian of a place, by means of the sidereal clock. This gives one of the co-ordinates and the other co-ordinate is given by the altitude of the body at its meridian passage, and by this means the position of the body and its motion at any time may be accurately represented. But the ancient astronomers had no such means at their disposal. They early recognised that the various groups of stars or constellations seemed to be bound together by an invisible chain and to be apparently fixed or practically so to the celestial dome or vault, which appeared to rotate about a certain definite axis practically fixed in space. Of this rotation of the celestial vault the *Sûryasiddhânta* says :

Bhacakraṃ dhruvayor baddhaṃākṣiptaṃ pravahānilaih
Paryetyajasram tannaddhā grahakakṣā yathākramam

" The starry sphere is said to revolve constantly through the influence of the pravaha winds, as also do the planets confined within their respective orbits ". The ancient astronomers must have noted moreover that there is one family of constellations, arranged along the whole of the celestial region, through which the sun, the moon and the planets (known to them) pursued their courses. The family constellations, therefore, came to be used as so many signs for indicating and describing the positions of these at any time and their motions from day to day. To explain this Zodiacal system in the light of common experience we suppose a big clock to be fixed in space with twelve divisions marked on it and the two hands indicating specified times, and then we see even at the first sight that such a clock bears a close analogy to the Zodiacal system with its twelve signs. Just as we can find the exact time simply by looking at the clock in a similar way the Zodiacal system gives the precise position of the sun at any time even on a moment's observation. For this reason, we must admit that whoever the first inventors of the Zodiacal systems may have been, this device of the signs and asterisms seems to be of very remote antiquity and speaks volumes for the ingenuity of the early students of astronomical science. We know that the sun's path on the celestial vault is a circle. If this is suitably divided into twelve parts, each arc will be found to be occupied by a group of stars, called a sign of the Zodiac irregularly placed but in such a way that the group may be taken roughly to give a distinctive character to the particular subdivision which

it occupies. Starting with any time of reckoning from an equinox (i.e. the moment at which the sun is at the equinox or when we have equal day and night, throughout the earth) each of these signs will be passed over roughly in one month and one mode of describing the sun's motion would obviously be to name the particular sign and the position in that sign that the sun occupies, at any particular epoch. In the same way the lunar path in the celestial vault being also a circle, this path might also be used in the same way as the circle or reference. This later circle was used by the Hindus, who divided its circumference into 27 parts. Now as the sun's path as well as the moon's are contained within the same belt of the celestial vault, the solar as well as the lunar positions might be described with reference to the tithis as well as to the signs. Also the fact that the motions of the sun, the moon and the planets are all confined to a narrow belt with the ecliptic as the central line enhanced the usefulness of these methods of representation. The lunar month consists of 30 lunar days or tithis. It is the moon's synodic period from one new moon to the next and the thirtieth part of this period is, therefore the lunar day. A solar month is the time which the sun takes to move from the beginning of one sign of the Zodiac to the next. A solar year consists of twelve solar months and this is called a Divya Day or a day of the gods (See *Sûryasiddhânta*).

Thus when the motion of the sun and the moon became completely known and their positions accurately predicted, the determination of the eclipses was naturally the next stage in the development of observational astronomy. This calculation of the eclipses the ancient astronomers performed with great skill and the solution was very correct, though naturally not so accurate as modern methods will yield. For it should be noted that for a successful solution of the problem of an eclipse, it was not necessary to definitely grasp the fact that it was the earth that was in motion; the result could have been the same, if the earth were at rest and the sun was moving about it, as the phenomenon is dependent on the motion of the cone of shadow cast by the earth, relatively to the moon and its node, and this motion would be the same, whether the sun is at rest and the earth is in motion, or the contrary is true. Thus in the *Sûryasiddhânta* :—" The earth's shadow s always six signs from the sun. When the place of the moon's

node is some degrees within or beyond the place of the shadow, the same thing will take place. At the end of a new moon, the sun and the moon are of the same signs and at the end of a full moon, they are at a distance of six signs. The moon, being like a cloud in a lower sphere, covers the sun in a solar eclipse; but in a lunar eclipse the moon moving eastward enters the earth's shadow, and the shadow obscures her disc ".

This observation of the sun's motion with reference to the signs of the Zodiac must have very early led to the discovery of the phenomena, namely that at each succeeding equinox, the sun does not come to the same stars, but that the signs and the stars are observed to have a motion relative to the point, which the sun occupies at either equinox and that the direction of motion is opposite to the sun's observed annual motion among the stars. In 134 B. C., HIPPARCHUS discovered this fact on observing a star which was new to him, but the precession was apparently long known to Hindu astronomers, and its rate determined by them roughly to a near approximation.

It is this precession which among other causes led to a great confusion in calculating the months of the calendar. Defining in general terms the period in which the Sun completes its cycle as the year, it is easily seen that the cycle may be said to be completed, either when the sun returns to the same point in space, the same point of a *tithi* (or a *rās'i*) or to the same solstice (or same equinox) as the one from which the year is reckoned. The first is called the tropical year and the second the sidereal year. Again the year may be determined by lunar months or the periodic times of other celestial bodies, as has been described in the *Siddhântas*. Further the difficulty is enhanced by the fact that none of these periods contain an exact number of days and the solar day is not a constant interval of time; hence it is a matter of no little wonder how the problem of the calendar was so successfully solved in India, China, Chaldea, Egypt and Greece in ancient times.

The study of Hindu spherical astronomy requires the knowledge of some special technical terms. Although no formal spherical trigonometry is exhibited in any text, the early Hindu astronomers were obviously acquainted with the principles that enabled them to solve spherical triangles. The traces of these principal formulae

are scattered in the body of the texts. Similar is the case with the coordinates used in Hindu astronomy. Though the coordinates used are almost the same as are found in modern astronomy, yet there are some distinctive characteristics. The terms generally made use of deserve mention here. The horizon is called Kṣitija, the equator viṣuvadvṛtta, the zenith dṛk, the terrestrial latitude akṣa, the declination krānti, the six-hour circle unmaṇḍala, the earth-sine kṣitijyā, the ascensional difference chara, the meridian yāmyottaravṛtta, the prime vertical samamaṇḍala, the parallax nata, the ecliptic apamaṇḍala, the declination-circle krāntivṛtta, the circle of latitude vikṣepa, and a vertical gnomon s'anku. The central ecliptic point, or point on the ecliptic which is 90 degrees distant from the horizon is termed the nonagesimal point or trivalagna or trivoṇa, and the sine of its zenith distance is termed dṛkkṣepa and its cosine dṛggati. The point of the ecliptic on the horizon at any time is termed lagna. The angle of position is called valana which has got two parts akṡavalana (deflexion due to latitude) and ayanavalana (deflexion due to obliquity). The term dṛkkarma has been used in connection with planetary conjunctions. Two planets are said to be in conjunction when they are on the same circle of position (i.e. on the same secondary to the prime vertical), and on such a circle the stars rise and set simultaneously. It then becomes necessary to find the longitude of the point of intersection of the circle of position with the ecliptic, when the true longitude of the star is known. The dṛkkarma correction is applied in this connection; it consists of two parts—âyanadṛkkarma and âkṣadṛkkarma. These are two hour angles which if denoted by θ and ϕ respectively will give

$$\text{Sin}\theta = \frac{\text{Sin } \lambda \times \text{Sin } \textit{Ayana valana}}{\cos d}$$

$$\text{and } \text{Sin}\phi = \frac{\text{Sin } \lambda' \times \textit{Sin Akṣa valana}}{\cos d \cos l}$$

Here λ is the latitude of the planet and the latitude called Spaṣtas'ara is λ', the latitude of the observer's place is l and d the declination of the planet. These are the main terms used.

Enough has been said by way of introduction. In the study of astronomical facts and in the observation of astronomical phenomena the early Hindu thinkers brought with their wonderful power of investigation a noble spirit of enquiry and a love for

the truth—a love almost akin to a spirit of veneration for the grand and sublime—and this made them in a fit of momentary trance to exclaim :—" O Lord, O Omniscient Creator, remove my doubt, for none else save thee can fathom this deep mystery ! " (*Sûryasiddhânta*).

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Reform of the Indian calendars. (1)

Abstract. — The calculations of the Indian calendars have been discussed by various writers from the chronological point of view; in this paper I deal with the main features of the Indian calendars and examine their agreement with observed facts.

The Hindu theory of the precession of the equinoxes and the terms sayana and nirayana are explained. The meanings of the terms year, ayana, month, tithi and nakshatra are considered and it is shown how two kinds of years, months, etc. (tropical, sidereal) are possible but that there can be only one interpretation for ayana.

The method of placing the ayanas and the months on a sidereal basis in the Indian calendars is defective and hence there is a difference of about 23 days in the calculations, which difference will increase in course of time. The equinoxes and solstices will therefore occur at varying parts of the year and there will be a corresponding acceleration of the seasonal changes. One important function of the calendar is the regulation of religious and sacrificial rites in accordance with the Shastras, and this function fails if the sidereal calendar is followed.

I make a few suggestions to bring the Indian Calendars into line with actual observations.

The calculations of the Indian calendars have been investigated at considerable length by a number of European writers (2) mainly with a view to fix the exact date of inscriptions, etc. Many of them have therefore contented themselves with determining the exact nature of the calculations without proceeding further to examine the correctness of these calendars. Such an examination and discussion must be started by our own countrymen and any reform necessary must come from within. I propose to deal with the main features of the Indian calendars and see how far these agree with observed facts.

Hindu astronomy mainly deals with the motions of celestial bodies situated in the zodiac and very rarely do we find references to stars outside this region. The religious and sacrificial rites of the Hindus were regulated by the motions of the sun, the

(1) Paper read before the Indian Science Congress, Madras—January 1929.

(2) BRENNAND, BURGESS, COLEBROOKE, SEWELL, THIBAUT, WARREN, WHITNEY.

moon and the planets; their conjunctions or oppositions with each other and with the lunar asterisms into which the zodiac is divided. Though the explanations offered for the motions of the sun, moon and the planets agreed mainly only with the Ptolemaic theory, it is fairly recognised that the Hindus possessed from very early times accurate values of the periods of revolution of the sun, the moon and the planets in the zodiac (3) This is the reason why the Indian calendars agree fairly well with observed conditions in most cases.

On one point, however, the Hindu astronomers do not appear to have possessed a correct notion. It is now generally well-known that on account of the spheroidal form of the earth and the fact that the sun and the moon move in the plane of the ecliptic and not of the equator, there is a slow motion of the polar axis and a consequent regression of the equinoctial points at an annual rate of about 50″. About this phenomenon, which is known as the precession of the equinoxes, there are various theories in Hindu astronomy. Some astronomers like BRAHMAGUPTA totally deny the existence of such a phenomenon. The *Surya* and *Parasara Siddhantas* speak of the regression of the solstitial colure, the line of the Rishis, but presume that it is of the nature of a libration through 54°, the equinox or Krantipata changing its position from the 3rd degree of Minam to the 27th degree of Mesham and then retracing its path in a period of 7200 years which corresponds to an annual rate of 54″ (4). ARYABHATA gives 48° as the amplitude of the libration which works out to 48″ (5). The *Siddhanta Siromani* gives a value of 1′ for the annual rate. (6) BHASKARA and MUNJALA mention a complete revolution of the places of the colures through the twelve signs of the zodiac, the mean annual rate of motion backwards being 48.6″ (7). It is probably because of this great divergence in theory that the Hindu astronomers have not generally adopted the tropical year as the basis of their calendars.

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(3) BRENNAND, *Hindu Astronomy*, Table; or COLEBROOKE *Essays* II. p. 411 and 412; Table.

(4) BRENNAND, *Hindu Astronomy*, 1896, page 78.

(5) COLEBROOKE, *Miscellaneous Essays*, Vol. II, page 378.

(6) SEWELL, *Indian Chronography*, art. 34.

(7) COLEBROOKE, *Miscellaneous Essays*, Vol. II, p. 378 and 382.

Their calculations are of two kinds, sayana and nirayana, one with motion and one without motion; that is, in one type of calculations the motion of the equinoxes is taken into consideration and the periods determined are all « tropical », and in the other type the precession of the equinoxes is not taken into account and the periods are determined with respect to the position of the equinox at the beginning of 3,600 Kali Yuga, i.e., they are sidereal.

The Hindu calendars calculate and furnish details regarding the year, ayana, month, tithi, vara, nakshatra, yoga and karana. I shall not consider the significance of the terms, vara, yoga and karana as it is not necessary for our purpose. Tithi relates to the interval between the positions of the sun and the moon; nakshatra depends upon the relative positions of the moon and the lunar asterisms on the zodiac. These two terms are therefore independent of the precession and I shall not dwell on them any longer.

A month is the period during which the sun remains in a sign of the zodiac and a year is the period of revolution of the sun in the ecliptic, that is, through the twelve signs. The interpretation of the terms, month and year, depends upon the meaning we attach to the term « sign of the zodiac ». The Hindu astronomers divide the ecliptic into twelve divisions of 30° each starting from a fixed point, the first point of the first sign Mesha, the position of the equinox at the beginning of 3,600 Kali Yuga. The instant at which the sun enters a sign may be defined as a « sidereal samkranti » and the interval between two successive « sidereal samkrantis » is a month according to the Hindus. Twelve such months is a sidereal year, the basis of Hindu astronomy.

On the other hand, when the precession of the equinoxes is taken into account, the samkranti may be called « a tropical samkranti ». A tropical samkranti takes place when the sun touches the first point of any one of the tropical signs which signs are likewise at intervals of 30° from one another, but the first point of the first sign exactly coincides with the vernal equinox as calculated for the year. That is to say, the sun's longitude is calculated from the vernal equinoctial point and not from the sidereal fixed point. The interval between consecutive tropical samkrantis gives tropical months and twelve such months a tropical year.

So it appears that tithi and nakshatra will be defined in the same way whether precession is taken into account or not; but that the month and the year have different meanings in the two cases. All the terms considered so far relate only to the motions of the celestial bodies in the zodiac and do not involve the directions of motion in their course relative to a terrestrial observer. This motion is introduced in the term ayana.

The term ayana literally means « motion » and the two halves Uttarayana and Dakshinayana into which a year is divided are the parts in which the sun has a northerly or a southerly course. In his « *Indian Chronology* » Mr. SWAMIKKANNU PIILAI defines Uttarayana samkranti as « name for Makara samkranti when the sun's sidereal longitude is 270°. The name is properly applicable only to the sun's tropical longitude of 270° when he begins to journey northwards, but in practice the name is applied as above. » (8) Uttarayana is therefore the interval from winter solstice to summer solstice and Dakshinayana the interval from summer solstice to winter solstice. These terms can thus be defined only with respect to the present position of the equinox and not with respect to any fixed point. There is therefore only one interpretation possible for the terms Dakshinayana and Uttarayana as these relate to the directions of the sun's course with respect to observers on the earth. The terms year and month are capable of two different interpretations depending on the origin chosen, whereas the terms tithi, vara and nakshatra mean just the same whatever may be the origin of coordinates.

We will next consider the systems of computation adopted in the Hindu calendars. Nearly all the *Siddhantas* follow only the sidereal system of calculation. The *Surya Siddhanta* certainly and the *Paulisa Siddhanta* probably treated of sidereal revolution only. The *Romaka Siddhanta* is in fact the only one of all Indian astronomical works which is based on the tropical system. (9) The duration of the year mentioned in it is exactly equal to the duration of the tropical year as calculated by PTOLEMY; and this *Siddhanta* is very rarely followed in the computations of our present almanacs. The *Surya Siddhanta* and the *Siddhanta*

(8) See Index under « Uttarayana ».

(9) *Pancha Siddhantika* with Introduction by THIBAUT. Introduction, p. 50.

Siromani, on which the computations are based, speak only of the sidereal year and «the sidereal months.» The ayanas are also made to begin from the first of Karkata and the first of Makara on the sidereal basis. This practice has probably arisen on account of the fact that at about 500 A. D. when modern Hindu astronomy was put on a systematic basis, the sidereal year began with the tropical year, the sidereal months with the tropical months and the ayanas began on the first of Karkata, and the first of Makara. Then the rithus began on the first of a month. As our present system of astronomy is based only on calculation and not on observation, the sidereal system of the Siddhantas is followed and we find that in the calendar Dakshinayana Punya-kalam occurs about the 15th of July, whereas the solstice occurs actually on or about the 22nd of June and similarly for the others. Again Vasantha rithu or spring does not begin on the 22nd of March as it ought to but begins on the 13th of April according to our calendars. The ayanas and the seasons as given by our present-day calendars are therefore late by nearly 23 days. If we allow the present state of affairs to continue for about 10,000 years, the sun will be having a northerly course when our almanacs declare Dakshinayanam and vice-versa; when astronomically we have spring, the almanac will show Sarad rithu.

The religious ceremonies done by those who follow the present day almanacs and make sayana Sankalpas, that is to say, who include in their Sankalpas the ayanas and the rithus are not done on correct dates (if they fall within certain specific periods). The marriages done now between the 21st of June and the 15th July are really done in Dakshinayana and against the Shastras, and the corresponding period from 22nd December to 13th January really belongs to Uttarayana though we believe it to be otherwise. This sort of sidereal calculations for the ayanas and rithus blindly following the chance coincidence that took place about 500 A.D. is wrong and must be corrected.

We will turn our attention to the month and the year. Strictly speaking there is nothing wrong in defining them as they have been defined in the *Siddhantas* on the sidereal basis. But if the ayanas and rithus are altered to the tropical basis, and the months and year calculated on the sidereal basis, the ayanas and rithus will not begin on the 1st of a month but on different dates

of the month as years pass on. By itself this is no great inconvenience to astronomers though for ordinary civil purposes it would be more convenient if the ayanas and rithus were made to begin with a month. It is therefore only for the sake of convenience that a change to the tropical basis for the month and year is suggested.

The Dakshinayanam must be made to begin on the day of the summer solstice and in order to bring the months into line with the ayanas and rithus, the year and the month of Mesha must be made to begin on the 21st of March, the day of the vernal equinox. The solar year will then be a tropical year in its commencement and duration. This change can be brought about in more than one way. The whole system of computation of the Indian calendar may be altered and placed on a tropical basis. This will involve a good amount of work but it is not altogether impossible. There now exist some tables which give also the results for the tropical months and years. Mr. SEWELL in his « *Indian Chronography* » (10) says « Though it is highly improbable that any Hindu Panchang or almanac for the year was based on the tropical samkrantis, it is possible that these were sometimes taken into account and were ascertained and stated as amongst the year's phenomena. Therefore for computation of Hindu dates we have to calculate occasionally the tropical samkrantis » and he gives a series of tables for these computations. Many of the prevailing almanacs also make mention of the tropical samkrantis. The *Srirangam Panchangam* and the *Panchangam* by Mr. VISWANATHA SROUTHI give two dates which differ by nearly 23 days for Meshayanam and Mesharavi, Rishabhayanam and Rishabharavi, and so on. The Telugu calendar, the Maharashtra calendar, the Bengal, Punjab and Jodhpur calendars all give two such dates under different names. It may therefore be said that the computations are there, only they are not followed. The proposed reform is therefore to make the months begin on the days of Meshayanam, Rishabhayanam, etc., and not on the days Mesharavi, Rishbharavi, etc., as it is at present done. If this change is to be brought about, 23 days in the Meenamasam of the current year must be ignored by making the 9th Meenam, the first of Mesham of next year.

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(10) SEWELL, *Indian Chronography*, art. 17.

If this change be considered too drastic another method may be adopted. The great difference of 23 days between the calculations may be dropped from the current year and further an interval of about 20 hours subtracted from the last day of the last month of every Akshaya hereafter. It may not be impossible to devise a method of intercalation to suit civil purposes, for example one day might be dropped from every cycle of 60 years in 5 cycles out of 6. This has the great advantage of retaining the sidereal computation.

It is obvious that some sort of reform of the Indian calendar is required in order to make its data conform to facts. Such changes are not against the spirit of our holy texts as some may contend. VARAHA MIHIRA in his *Brihat Samhita* recounts the qualities of a learned man (11) « As to mathematical astronomy, he must be able to prove experimentally (when there is discrepancy) by means of the agreement between observation and calculation at what moment the sun has reached the solstitial point ». BHASKARA adverts to this point in the *Vasana Bhashya* and says (12) « In mathematical science holy tradition is authority, so far only as it agrees with demonstration, whichever agrees with present observation must be admitted. » A series of changes in our astronomical computations have taken place whenever learned men realised that their calculations did not agree with facts. (13) We had first the lunar computation, then the solar computation, and then the luni-solar reckoning as necessity arose for such changes. The beginning of the year had also been changed three times in the past so that the seasons as given by the calendars and the actual seasons may not differ. A study of the European calendar shows that a similar change was made by Pope GREGORY in the year 1582. (14)

We know how much difficulty was felt in introducing the Gregorian Reform of the calendar. (15) One of the countries, Russia, persisted in using the Old Style calendar until a few years ago. A similar reform in such a conservative country as

(11) J. R. A. S. (1870), p. 435.
(12) COLEBROOKE, *Miscellaneous Essays*, vol. II, p. 381.
(13) *Hindu Astronomy*, chapter IV. Hindu months and seasons.
(14) PHILIP, *The Calendar*, part I and VII, p. 21.
(15) YOUNG, *General Astronomy*, art. 221, p. 149.

ours cannot be expected to be made easily. The reform is imperative and must be begun at once. All scientific bodies interested in Hindu astronomy must pronounce themselves in favour of such a change and must declare its necessity. If necessary, committees for the detailed calculations of tables must be formed. At the same time heads of religions must be convinced of the desirability of the change from a strictly religious point of view. An amount of up-hill work must be done, and I hope it will be attempted now and here if the principle is accepted.

Annamalai University G. V. KRISHNASWAMI.
South India.

A Century of American Geodesy.

Minerva presided over the organization of the U. S. Coast Survey. In 1816 practical operations were started, by the use of the best instruments made by the foremost European makers, and under the superintendence of F. R. HASSLER who had enjoyed the best technical training that Switzerland, France and Germany could give. Nor was this all. HASSLER enriched European technique by inventions of his own, placing American geodetic operations, as BESSEL stated, on a plane of perfection surpassing that of Europe. But Nemesis brought her chastisement of American endeavor through the U. S. Congress. Having no conception of the time required for accurate triangulation surveys, Congress eliminated HASSLER because so little progress had been made in more than a year and a-half, and the work was assigned to officers of the army. (1) There being no expert geodesist in the army, and no one in authority to follow a uniform and consistent scientific program, the attempts of the next fourteen years were dismal failures. Seeing at last the error of its way, Congress in 1832 reinstated HASSLER, and for eleven years steady progress was made on a high plane of scientific achievement.

After the death of HASSLER, ALEXANDER DALLAS BACHE, a great grandson of BENJAMIN FRANKLIN, became superintendent. BACHE had made a brilliant record at West Point and had received good scientific training at home and abroad. In his studies of geodetic methods he had sought the advice of HASSLER. For nearly a quarter of a century, BACHE successfully steered the Coast Survey past the dangerous shoals of political interference. The territorial expansion of the triangulation work of the Coast Survey can

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(1) F. R. HASSLER, Principal Documents relating to the Survey of the Coast of the United States, New York, 1834, p. 16-19; F. CAJORI, The Chequered Career of FERDINAND RUDOLPH HASSLER, Boston, 1929, p. 85-89. (*Isis*, 13, 119-21)

best be shown by maps. Fig. 1 shows, by two crosses, where in New York and New Jersey HASSLER began work in 1816.

During the twenty months in 1816—1818 HASSLER measured two base lines, one six miles long in New Jersey, the other five miles long in Long Island; eleven stations were occupied, forming the elements of 124 triangles.

During the years 1832—1843, HASSLER extended the triangulatition eastward to Rhode Island and southward to the Chesapeake Bay, as shown by the heavy black lines. (2) In 1854, after eleven years of BACHE's superintendency, the advance is shown in the lightly shaded part of the coast; preliminary determinations of a chain of triangulation extended « with a single broken link of fifteen miles », from Penobscot Bay in Maine, to Bogue Sound in North Carolina. South of this it passed up Cape Fear river to Wilmington, included Georgetown harbor in South Carolina, the vicinity of Savannah in Georgia, parts of the Florida coast both east and west, Mobile, New Orleans and Galveston. Thus along these long stretches the triangulation was begun. In some cases the primary triangulation led, while in others it followed the secondary triangulation. It was not continuous, the parts rested upon carefully measured bases which when the surveys were united, served as bases of verification. (3)

In 1850 work was begun in the far West on the Pacific coast; the theodolite of the geodesist followed closely the sheet-iron pan of the miner. In 1854 triangulation embraced the region of San Francisco and San Pablo Bay, as well as of San Diego.

A dozen years later, (4) in 1866, near the end of BACHE's superintendency, we find, Fig. 2, the triangulation completed along the Atlantic shore from Maine to Cape Fear in North Carolina, also along the coast of South Carolina and Georgia, and further progress in the geodetically difficult regions of Florida and the Gulf coast. On the Pacific, the triangulation was completed in the vicinity of San Francisco, Santa Cruz and Monterey, while noted progress was made in Santa Barbara and San Diego, as well as in the region of Seattle.

(2) F. CAJORI, *op. cit.*, p. 181.
(3) U. S. Coast Survey Report, 1854, p. 4 and maps.
(4) U. S. Coast Survey Report, 1866, Chart 25.

FIG. 1. — The two crosses near New Jersey and Long Island indicate where Hassler began the triangulation survey in 1816-1818. The heavy black line drawn from Rhode Island to Chesapeake Bay marks the region which Hassler surveyed during 1832-1843. The shaded parts of the Coast show detached surveys made by Bache during 1843-1854.

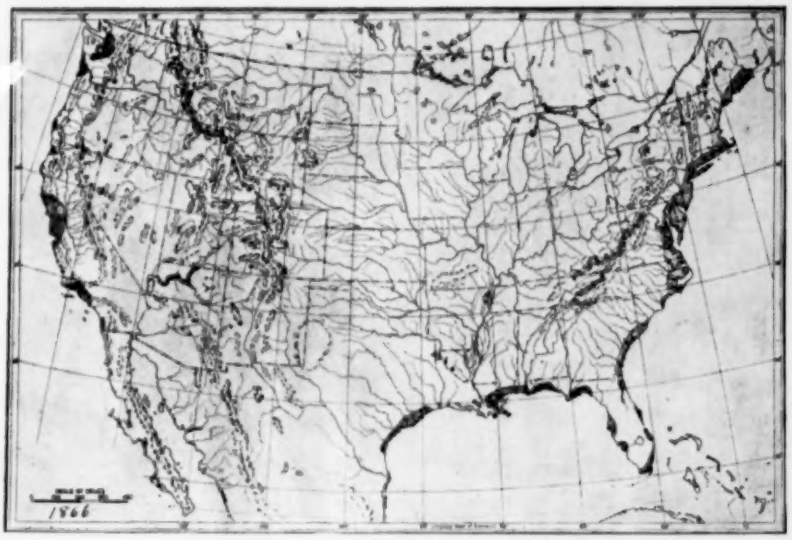


FIG. 2. — The shaded parts along the Coast indicate the parts surveyed by triangulation before 1866.

Isis, XIV, pl. 22. F. CAJORI.

FIG. 3. — The shaded parts mark the territory along the Coast and in the interior triangulated before 1874.

FIG. 4. — The sections of the country along the Coast and in the interior triangulated before 1884.

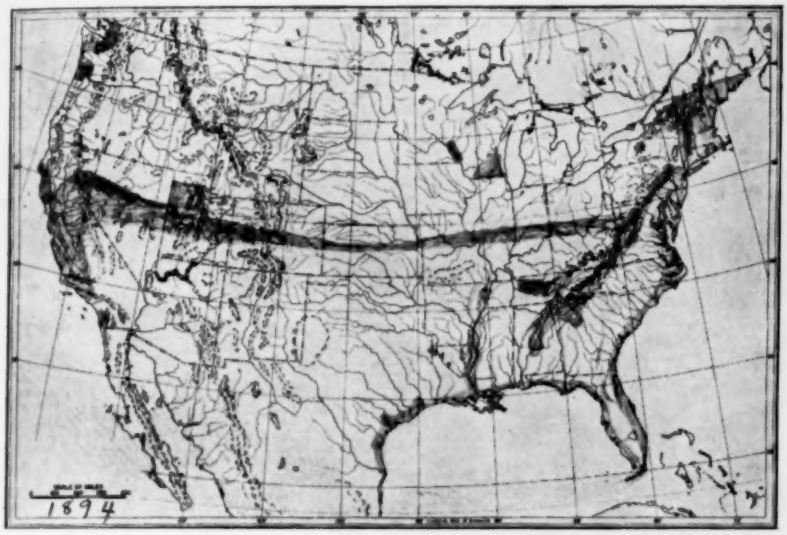


FIG. 5. — The Atlantic and Pacific surveys connected by a chain of transcontinental triangles in 1894.

FIG. 6. — Before 1904 a chain of triangles along the 38th and 37th meridians was added to the region surveyed.

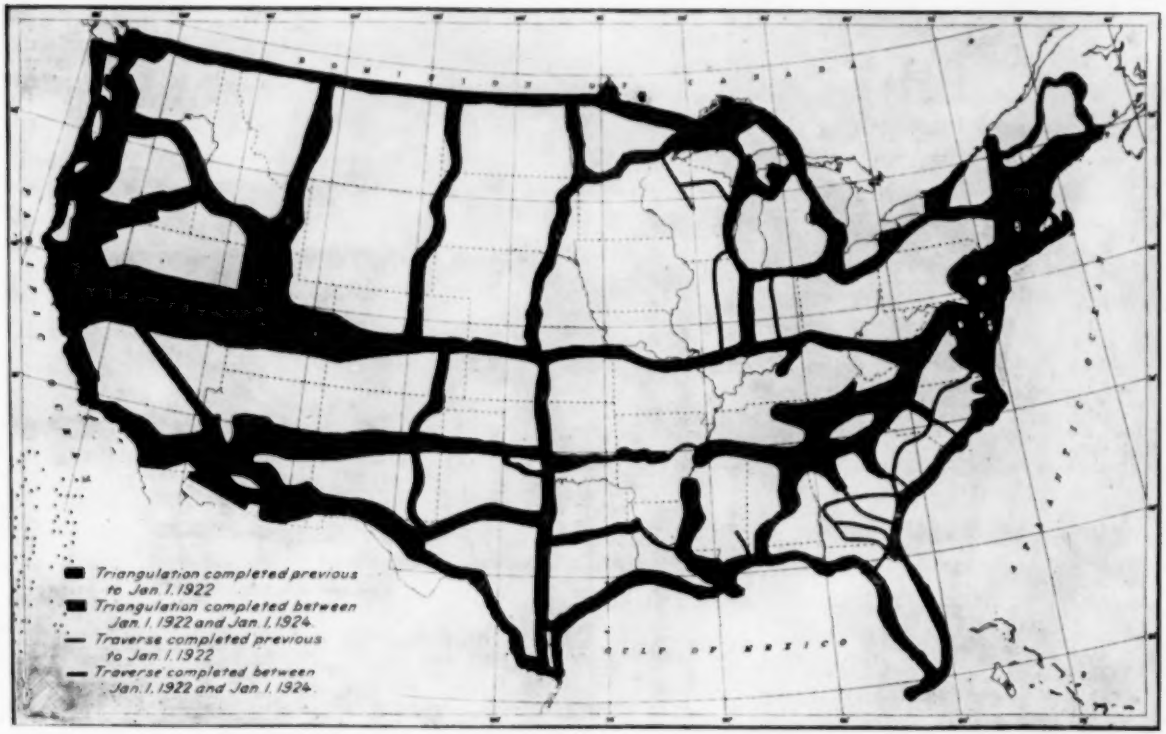

Triangulation completed previous to Jan. 1, 1922
Triangulation completed between Jan. 1, 1922 and Jan. 1, 1924
Traverse completed previous to Jan. 1, 1922
Traverse completed between Jan. 1, 1922 and Jan. 1, 1924

FIG. 7. — The triangulation survey as it had progressed in 1922 and 1924.

Isis, XIV, pl. 25. F. CAJORI.

The third superintendent of the Coast Survey, BENJAMIN PEIRCE of Harvard, introduced a great expansion in the program of triangulation. Not only should the coast be covered by a chain of triangles, but also the interior of our country. The name « United States Coast Survey » was accordingly expanded to « United States Coast and Geodetic Survey ». (5) This enlarged plan would not only eventually supply much more accurate maps of the interior, but would also supply data for a more minute study of the figure of the earth. The first steps toward this goal are seen in the map, Fig. 3, issued in 1874. (6) All of New Hampshire, Vermont and Connecticut was covered with triangles, although the triangulation was not then completed. The survey extended over parts of the interior of Massachusetts, also the Blue Ridge Mountains from Maryland to Alabama, and in the West the triangulation, though incomplete, covered the territory from San Francisco to Mt. Shasta and to central Nevada.

In 1884 under the superintendency of J. E. HILGARD, the sketch of general progress, Fig. 4, displays a fairly continuous survey of the eastern coast, an invasion of the interior of New York, Virginia, Tennessee, Illinois, Missouri, Wisconsin, Colorado and Nevada. (7)

In 1894 the chain of triangles, Fig. 5, between east and west is established, accomplishing a connection in geodesy which in travel and commerce had been reached through the building of the Union Pacific Railroad, 25 years previously. (8)

In 1904 the triangular net work, Fig. 6, is extended and a north and south chain of triangles along the 98th and 97th meridian is initiated. (9)

Jumping to the year 1922, Fig. 7, the triangulation appears as shown in the next map. (10) This transcontinental system of triangles has been connected with similar systems in Canada and Mexico, so that any point in North America touched by

(5) U. S. Coast and Geodetic Survey Report, 1878, p. 3. This is the earliest report containing the word « Geodetic » in the title of the Survey.

(6) U. S. Coast Survey Report, 1874, p. 2, Sketch No. 1.

(7) U. S. Coast and Geodetic Survey, 1884, Sketch Nos. 1, 2.

(8) U. S. Coast and Geodetic Survey, 1894, Sketch Nos. 1, 2.

(9) U. S. Coast and Geodetic Survey, 1904, Sketch of general progress.

(10) U. S. Coast and Geodetic Survey, Special Publication, No. 23, 1928, Revised edition, Fig. 14.

these triangles can be expressed with great accuracy, as so many degrees, minutes and seconds of longitude and latitude, and as so many meters from an arbitrarily chosen point (located in Kansas) and, since 1913, known technically as the « North American datum. » The early work on such a datum goes back to 1901 and was first called the « U. S. standard datum. » (11) In « Precise triangulation », executed in belts about 100 miles apart, the triangle closing error should not exceed 3 seconds, and the average error should be less than one second. (12) In « primary triangulation » to subdivide areas not located in precise belts, the triangle closing error should not be over 6 seconds, the average error should not exceed 3 seconds. Less rigorous demands are made upon secondary and tertiary triangulation. By accurate triangulation the stability of the earth's crust may be tested. After the San Francisco earthquake of 1906, stations in that region were reoccupied and differences in geographic positions of stations were shown. Mt. Tamalpais had moved south 5 ft., Lick Observatory east and south 4 ft., the city of San Jose had moved north 15 ft. (13)

But triangulation represents only a small part of the work of the Coast Survey. As early as 1832, under HASSLER, hydrography played an important role; it determined the depth and configuration of the waters along our shores. The location of uncharted rocks, banks, shoals, discovery of changes in channels and new entrances to harbors, examination of shoals for purposes of harbor improvement, have all been of incalculable value to navigation in all regions from Maine to Florida and the Gulf, as well as on the Pacific coast. A wire drag is used for locating isolated rocks such as occur at the coasts of Maine and Alaska, or isolated coral heads in tropical regions. (14) Since 1923 the sound-echo method of determining depths has been used. (15) In this method the time is measured, in thousandths of a second,

(11) U. S. Coast and Geodetic Survey, Special Publication, No. 86, 1922, p. 1-4.

(12) U. S. Coast and Geodetic Survey, Special Publication, No. 93, 1923. p. 2.

(13) U. S. Coast and Geodetic Survey, Special Publication, No. 106, 1924, p. 12.

(14) U. S. Coast and Geodetic Survey, Special Publication, No. 23, 1928, Revised edition, Fig. 22.

(15) *Ibidem*, p. 105.

for a sound wave to descend to the bottom and return to the surface.

The study of the tides and of currents in the water received attention from the earliest days of the Survey. In more recent years tide tables have been published in advance. Since 1885 a tide-predicting machine has been used, which was designed by WILLIAM FERREL (16) on the general plan devised by Lord KELVIN in 1872.

Astronomical observation, strongly recommended by HASSLER, was first entered upon by BACHE about 1846. In early days the accurate determination of longitude and latitude was a troublesome problem. The Coast Survey was able to introduce great improvements. TALCOTT's method of determining latitude, invented by Captain ANDREW TALCOTT of the U. S. Corps of Engineers in 1834 and, as we know now, first suggested by HORREBOW in Denmark, came to be used in the Coast Survey. Longitude determinations which vexed the old astronomers were brilliantly advanced in America. The electric telegraph of 1844 was used in 1850 by the Coast Survey for longitude determinations. Since 1922 radio signals have been introduced and in that year, at an international gathering of astronomers in Rome, it was proposed to determine a net of longitude differences to circle the globe (17). The direction of the true north at various points of a survey is found astronomically by observations on the sun or on Polaris, and is necessary for finding magnetic declinations.

Observations on terrestrial magnetism were inaugurated by Superintendent BACHE in 1843. Before this, GAUSS had invited HASSLER to take up this work, but HASSLER declined for financial reasons. (18) HASSLER experienced great difficulty in securing from Congress funds for the ordinary work of the Survey and he was unwilling to enter upon the highly specialized field of magnetic observation, unless he could impress upon it a quality truly scientific. Under BACHE and his successors magnetic observations became an essential part of the preparation of nautical charts of coastal waters. In 1856 there were about 160 magnetic stations in the United States. A systematic magnetic survey

(16) *Ibidem*, p. 70.

(17) U. S. Coast and Geodetic Survey, Special Publication, No. 92, 1923, p. 1, 2; No. 104, p. 5.

(18) F. CAJORI, *op. cit.*, p. 173.

of the country was undertaken in 1899. Nearly all the early land surveys in the United States were made by compass and the boundaries in the deeds of land were defined by compass bearings. As these bearings at any one locality are not constant, a knowledge of its changes in the course of years became necessary for the proper location of land property. In 1915 there were about 5000 stations at which the magnetic elements,—declination, dip, horizontal intensity,—had been determined by the Coast Survey. Scientific questions of subtle nature appear to be involved in the earth's behavior as a magnet. (19)

Pendulum experiments were begun at a station in Massachusetts by C. S. PEIRCE, about 1874, to determine the intensity of gravitation. In 1882 a party going to New Zealand to watch the Transit of Venus made pendulum experiments there and also in Tokio and San Francisco. In recent years progress has been made in the technique of pendulum experimentation. Determinations of the relative intensity of gravity are made for the solution of certain problems in geology and isostasy and the figure of the earth. The flattening or compression of the earth was found in 1916 to be 1/297.4 (20); this is somewhat smaller than ISAAC NEWTON's theoretical value 1/230, based on the assumption of uniform density of the earth.

Lack of time prevents more than the mere mention of the work of leveling, traverse measurements, topography, oceanography (since 1846), seismology (since 1925), and surveys in regions like the Mississippi delta by photographs taken from airplanes. In recent years much attention has been given to the invention of speedier and more economic methods of survey, which at the same time meet all requirements of accuracy.

Such in crude outline is the century's work of the U. S. Coast Survey. Despite some mistakes in the selection of superintendents, the achievements reflect credit upon American science. The sway of Minerva has not always been undisputed, but in the main has been supreme.

Berkeley, California. FLORIAN CAJORI.

(19) U. S. Coast and Geodetic Survey Report, 1881, Appendix 9; Special Publication, No. 94, 1923, p. 1-14.

(20) U. S. Coast and Geodetic Survey, Special Publication, No. 40; No. 104, 1924, p. 16; No. 23, 1928, Revised edition, p. 117-122.

Medallic Illustrations of the History of Science

(*First Series : XIXth and XXth centuries*).

Ninth Article.

This collection of scientific medals began to appear in volumes 8 of *Isis*. The eighth article appeared in volume XIV, p. 215-18, pl. 6-9, 1930. The Editor will welcome photographs or suggestions for the following parts of this series. It is intended to publish only medals having a sufficient scientific and artistic interest. Medals dedicated to scientists who are still living can not be published at once, but will be considered for ulterior publication. GEORGE SARTON.

No. 48. (FRANÇOIS) ÉMILE MAUPAS. Born at Vaudry, Calvados, 1842; died, Algiers, 1916. French protozoologist.

Artist : C. H. or CH.? (CHAPLAIN?).

Date : 1913.

Size : 63 × 41 mm.

Collection : Cabinet des Médailles, Paris. (Courtesy of Mme. H. METZGER).

Obv. : Portrait (fig. 67). ÉMILE MAUPAS. C. H.

Rev. : Rajeunissement caryogamique des ciliés, 1889. Sexualité des rotifères, 1890, et des nématodes, 1900, etc. (fig. 68).

No. 49. ADOLPHE (THÉODORE) BRONGNIART. French botanist. Born Paris, 1801; died Paris, 1876. One of the founders of palaeobotany.

Artist : OSCAR ROTY (1846-1911).

Date :

Size : 47 mm.

Collection : Cabinet des Médailles, Paris. (Courtesy of Mme. H. METZGER).

Obv. : Portrait (fig. 69). ADOLPHE BRONGNIART. O. ROTY.

Rev. : Membre de l'Académie des sciences. Professeur de botanique au Muséum d'histoire naturelle. Inspecteur général de l'enseignement supérieur. Commandeur de la Légion d'honneur. XIV. janvier MDCCCI, XVIII février M.DCCC.LXXVI.

No. 50. HENRI MOISSAN. French chemist. Born, Paris, 1852; died, Paris, 1907. Cyanogen compounds. Isolation of fluorine, 1886. Electric furnace. Artificial diamonds.

Artist : J. C. CHAPLAIN. French medallist (1839-1909).

Date : 1906.

Size : 57 × 46 mm.

Collection : Cabinet des Médailles, Paris. (Courtesy of Mme. H. METZGER).

Obv. : Portrait (fig. 70). HENRI MOISSAN. J. C. CHAPLAIN, 1906.

Rev. : A HENRI MOISSAN, Membre de l'Institut. En souvenir du 20e anniversaire de sa découverte du fluor. Ses élèves, ses amis. 1886-1906. (Electric cell).

No. 51. ÉTIENNE GEOFFROY SAINT-HILAIRE. French zoologist and anatomist. Born, Étampes, 1772; died, Paris, 1844. Member of the expedition to Egypt. Loi du balancement des organes. Theory of evolution.

Artist : JOSEPH DANTZELL. French medallist, born at Lyon, 1805; died at Paris, 1877. (FORRER, I, 506, 1904; 7, 204, 1923).

Date :

Size : 40 mm.

Collection : Cabinet des Médailles, Paris. (Courtesy of Mme. METZGER).

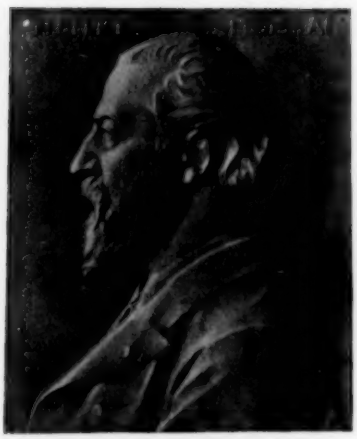
Obv.: Portrait (fig. 71). GEOFFROY St. HILAIRE. DANTZELL F.

Rev.: Né à Étampes, 15 avril 1772. Auteur de la philosophie anatomique. Fondateur de la Ménagerie, An 2 - 1793.

No. 52. (LOUIS FRANÇOIS) JOSEPH BERTRAND. Born Paris, 1822; died Paris 1900. French mathematician. Historian of mathematical sciences.

No. 48. Maupas.
(Figs. 67, 68)

No. 49. Brongniart.
(Fig. 69.)



No. 50. Moissan.
(Fig. 70.)

No. 51. Geoffroy St. Hilaire
(Fig. 71.)

No. 52. Joseph Bertrand
(Fig. 72.)

No. 53. J. H. Fabre.
(Figs. 73, 74.)

Artist: JULES CLÉMENT CHAPLAIN. French medallist. Born at Mortagne, Orne, 1839; died 1909.

Date: 1894.

Size: 67 mm.

Obv.: L^IS F^ÇOIS JOSEPH BERTRAND. Membre de l'Institut. (fig. 72).

Rev.: A JOSEPH BERTRAND. Membre de l'Académie française. Secrétaire perpétuel de l'Académie des sciences. Pour honorer 50 années de dévouement à la science et à l'enseignement. Ses éléves, ses admirateurs et ses amis. Mars 1844-1894. (laurel branch).

No. 53. JEAN HENRI FABRE. French entomologist (1823-1915). See medal No 5. (*Isis*, 8, 335) by SICARD.

Artist: LOUIS PATRIARCHE. French medallist. Born at Bastia, Corsica (FORRER, vol. 4, 429, 1909.

Date: 1911.

Size: 70 × 50 mm.

Collection: LYMAN C. NEWELL, Boston.

Obv.: Portrait (fig. 73). J. H. FABRE. Entomologiste. L. PATRIARCHE, 1911.

Rev.: (FABRE's home at Sérignan, fig. 74).

Notes and Correspondence

Comité international et Centre international d'histoire des sciences
(Secrétariat et Centre de travail : Hôtel de Nevers, 12 rue Colbert, Paris 2e).

The following corresponding members were promoted to full membership on February 15, 1930 : ROBERTO ALMAGIÀ, historian of geography, Rome ; WILLIAM HENRY WELCH, historian of medicine, Baltimore, Maryland ; MAX WELLMANN, historian of Greek science (chiefly medicine), Potsdam ; ERNEST WICKERSHEIMER, historian of medicine, Strasbourg.

The following corresponding members were elected on the same day : Father FRANCIS XAVIER KUGLER, Dutch Assyriologist ; MICHAEL STEPHANIDES, historian of Greek science, Athens ; H. S. W. DICKINSON, historian of technology, London ; EMILE MEYERSON, historian and philosopher, Paris ; JOSEPH BIDEZ, Hellenist, Ghent, Belgium ; ANDREA CORSINI, historian of medicine, Florence ; ROBERTO MARCOLONGO, mathematician and physicist, Naples ; JOSÉ SÁNCHEZ PÉREZ, historian of Spanish mathematics, Madrid ; GEORG STICKER, historian of medicine, Würzburg ; SAMUEL DICKSTEIN, historian of mathematics, Warsaw.

The following corresponding members have recently died : Father KUGLER and A. V. VASSILIEFF. A biography of the latter appears in this number of *Isis*. For more information on the Comité and its activities, see *Archeion*.

II. Queries and Answers

Edited by T. L. DAVIS, Cambridge, Mass.

Answer to Query nº. 7 (*Isis*, 9, 425-26). Measurement of mountain altitudes—See F. CAJORI : ***History of determinations of the heights of mountains*** (*Isis*, 12, 482-514, 1929).

Query no. 14. — On the use of the word kardaja—Extract from a letter to the Editor, dated New York, March 7, 1930 : « You may be interested in a 14th century use of the word, kardaja, which differs somewhat from that indicated in your *Introduction*, p. 530, note o. In

the observation in 1318 by JOHN DE MURS of the entry of the sun into Aries, to which DUHEM refers (*Système du monde*, IV, 31), and the Ms. of which I have examined afresh, the word is used for an instrument with a radius of 15 feet (contrast the 6 ft. 9 inch radius of TYCHO BRAHE's much vaunted mural quadrant) and an arc « one sixth of a quadrant » or 1/24th rather than 1/96 of the circle. The Latin of Ms. BN. 7281, fol. 160 r reads according to my notes :

' Et ego prefatus Io. multo affectu desiderans veritatem huius sensibiliter agnoscere mihi corde omnia ista consens et comprehendens instrumentum ad hoc congruum 15 pedum in semidyametro conficiens sextam partem quadrantis arcuatam quod kardaga nominatur elevavi in vera meridiona super lapidem immobilem rectissime quam possibile fuit et viribus solis notabiliter radiantem anno domini 1318 imperfecto a ianuario 13a die martii super terram b. que ad modicam distat a parisiis ab occidente 41° 26' 40" a qua subtraxi altitudinem. ' I think kardaga is the spelling here, not kardaya as DUHEM gives it, and that arcuatam means curved, not divisée, as he suggests. » LYNN THORNDIKE.

Answer no. 14.—The note o (p. 530 of my *Introduction*, vol. 1; see also p. 387) was a little too short, and I welcome the opportunity of extending it. The Arabic word kardaja was in all probability derived from the Sanskrit word kramajyâ meaning straight sine (as opposed to versed sine). The word kramajyâ was used originally to designate any sine; but later its use was restricted to the sine of the angle of 3°45 (225': the twenty-fourth part of the quadrant). That angle was given a fundamental importance in Hindu trigonometry; it was the unit angle in the computation of their tables; it was deemed small enough to permit the interchange of arc and sine.

As for every oriental word, there are necessarily many variants of this one : kardaga, kardaya, gardaga, cardaga. My spelling is the exact transcription of the Arabic script (1) according to the system followed in *Isis* and in my *Introduction*. I must add that I have failed to find the word kardaja (or variants) in the great dictionaries of LANE and DOZY, but this is not very surprizing, as it is a *mathematical* term of *foreign* origin.

To return to the *thing*. Kardaja was originally the sine or arc of 3°45', but at some later time it became the arc of 15°, i.e., an arc four times larger. In AL-BÎRÛNÎ's *Ta'rîkh al-Hind* composed at Ghazna, c. 1030, it was still 3°45', but in the Toledan tables it was already 15°. However we have no right to conclude that the change occurred between

(1) As given by BONCOMPAGNI, 1869, 183.

c. 1030 and c. 1080, because AL-BÎRÛNÎ was working in Afghanistan and AL-ZARKÂLÎ in Andalusia. The kardaja of 15° was probably a Spanish or Maugrabin innovation which may have been somewhat anterior to AL-BÎRÛNÎ. Bearing that restriction in mind, we might say that the kardaja came to mean an arc of 15° in Western Islâm some time in the eleventh century.

GERARD OF CREMONA's translation of the Toledan tables was in all probability the channel through which the kardaja (of 15°) became known to the Latin world. JOHN OF MURS's use of the word was almost certainly derived from that source. The word was also used—always in the same acceptation (15°)—by JOHANN VON GEMUNDEN, GEORG VON PEURBACH and REGIOMONTANUS.

It would be interesting to know more exactly when the kardaja of 3°45' became four times larger, which reason (or accident) caused the change and who was responsible for it. To my knowledge the earliest author to use the larger kardaja was AL-ZARKÂLÎ.

FRANÇOIS WOEPCKE : Sur le mot kardaga et sur une méthode indienne pour calculer les sinus (*Nouvelles annales de mathématiques*, vol. 13, 386-94, Paris, 1854). BALDASSARE BONCOMPAGNI : Intorno all'opera d'ALBIRUNI sull' India (*Bullettino di bibliografia e di storia delle scienze matematiche*, vol. 2, 153-206, Roma, 1869). EDWARD SACHAU : ALBERUNI's India (1888 ; reprinted 1910 ; see vol. 1, 275). M. STEINSCHNEIDER: Miscellen (*Bibliotheca mathematica*, vol. 5 of second series, 114, 1891). A. v. BRAUNMÜHL : Vorlesungen über Geschichte der Trigonometrie (vol. 1, Leipzig, 1900). GEORGE SARTON.

Query no. 15.—Stephen Hales's Library.—In HALES's last will and testament dated October 30, 1759, occurs the statement : « All my bound Books at Teddington, which my Executor hereafter named, shall think proper to be sent to Georgia, I give and bequeathe for a public parochial Library to such Town or Parish in Georgia in America, the Governor shall think fit to appoint. The carriage of them thither to be at the expense of my Executor and Executrix hereafter named. » (A. E. CLARK-KENNEDY : STEPHEN HALES, Cambridge, 1929, p. 241 ; *Isis*, 13, 370-73). Wondering whether these books had actually been sent to Georgia, and if so, where they were kept, I asked my good friend, Miss LUCY STANTON of Athens, to make investigations, which she kindly did. In answer to her enquiry, Miss RUTH BLAIR, State historian and director of the Georgian archives, wrote the following letter, dated Atlanta, March 15, 1930 :

« After exhausting the sources in this department without finding any reference to the books of STEPHEN HALES being sent to Georgia,

we went to the State Library to examine the records there. The State Librarian tells us that the Library has had several requests in regard to these books and that her department has recently gone into the matter rather fully for a member of the faculty of Johns Hopkins University. No reference could be found to the gift, and Mr. LEONARD MACKALL of Savannah, who is very familiar with the collections of the Georgia Historical Society and the DeRenne Library has never seen anything to indicate that the books were ever sent to a Georgia Library. »

Does this really close the question? Would HALES's wishes have been so totally disregarded? Could no information be obtained on the subject in England? G. S.

III. Miscellanea.

The William Henry Welch Jubilee, Washington, April 8, 1930. The Jubilee of the illustrious and beloved physician was celebrated on his eightieth birthday, April 8, 1930, in the Memorial Continental Hall, in Washington. As all the newspapers have given full accounts of it, it is hardly necessary to go into details. It will suffice to recite the main facts.

The order of the day was as follows: Addresses by the chairman, LIVINGSTON FARRAND, and by SIMON FLEXNER, and HERBERT HOOVER. Presentation of the dry point portrait, admirably designed by ALFRED HUTTY of Charleston in South Carolina. Response by Dr. WELCH. A beautiful program was given to those present. Its graceful preface may be reproduced:

« To have stepped, in the prime of life, into a position of acknowledged intellectual leadership in the profession of his choice; to have occupied that position, albeit unconsciously, for those forty years which have seen the most rapid strides in medical progress of all time; to have had such influence in the furtherance of the medical sciences in this country as to turn the tide of students seeking opportunities for higher education from the Old World to the New; to have been as ready in countless unrecorded ways to share his time and thought with those who were inconspiciuous as with those who sat in high places; to have been no less universally respected for his great learning than beloved for his personal charm and companionability; to have stood knee-deep in honours unsought and to have remained seemingly unaware of them; to have rounded out with distinction two successive university positions and, with enthusiasm undimmed, to be now well launched on a third, which he is no less certain to adorn.—To have done so much, in so many ways, for so many years, and to have aroused no shadow of envy or enmity on the way,

betokens not only unselfishness of purpose but that fineness of character which always has been and always will be an inspiration to mankind. »

Our every good wish to Dr. WELCH and may he live many more years for the guidance of American medicine, and the happiness of his friends.

GEORGE SARTON.

Henry C. Mercer. Am 9. März starb zu Doylestown in Pennsylvanien Dr. HENRY C. MERCER. Er war einer der wenigen Industriellen Amerikas, die sich für die Entwicklung der Technik interessierten. Er veröffentlichte eine Reihe von Büchern über die Entwicklung von Werkzeugen und Geräten und kaufte tausende von solchen Originalen an, die er in einem eigenen grossen Museum aufstellte.

F. M. FELDHAUS.

Reviews

Rafael Bombelli.—*L'Algebra. Opera di* RAFAEL BOMBELLI da Bologna. Libri IV e V comprendenti « La Parte Geometrica » inedita tratta dal manoscritto B. 1569 della Biblioteca dell'Archiginnasio di Bologna. Pubblicata a cura di ETTORE BORTOLOTTI. N. 7 della collezione *Per la storia e la filosofia delle matematiche* diretta da FEDERIGO ENRIQUES. IV+302 p., facsim., figs. Bologna, NICOLA ZANICHELLI, 1929. (Lire venti)

This is the book announced in the *Periodico di matematiche*, 8, 334-344, 1928 ; see *Isis*, 13, 442, 1930. BOMBELLI's *L'Algebra... Divisa in tre libri Con la quale ciascuno da sè potrà venire in perfetta cognitione della teoria dell'Aritmetica...* » was published in Bologna, in 1572, and remained for a long time an outstanding treatise on the subject : LEIBNIZ chose it for the study of cubic equations. As indicated by its title, the 1572 edition consisted of three books ; the beginning and the end of book III mention BOMBELLI's intention « di dare al mondo tutti questi problemi in dimostrationi geometriche ». The privilege « di dare al mondo » the books IV and V—i libri geometrici—was reserved for ETTORE BORTOLOTTI who discovered, in the codex B. 1569 of the Biblioteca dell'Archiginnasio of Bologna, a complete Ms. of BOMBELLI's *Algebra*. The beautifully written Ms. is a contemporary transcript (apparently by F. M. SALANDO) representing the state of BOMBELLI's *Algebra* around 1550.

The books I and II are essentially the same in the Ms. and in the 1572 edition. Book III of the 1572 edition differs considerably from book III of the Ms., chiefly by the incorporation of 143 Diophantine problems ; BOMBELLI and ANTONIO MARIA PAZZI were the translators, between 1567 and 1572, of the first five books of DIOPHANTOS.

The titles given by BORTOLOTTI to the three « chapters » of Book IV (Algebra linearia. Rappresentazione geometrica degli irrazionali. Costruzione geometrica di problemi algebrici) and to the two « chapters » of Book V (Problemi di geometria piana. Poliedri regolari e semiregolari) indicate the variety of the material dealt with ; BOMBELLI's ingenious treatment of the problems involves the introduction (p. 72) of the general representation of powers by segments, the consideration of negative segments (p. 66) and of negative areas (p. 84), etc.

BORTOLOTTI's preface (p. 1-24) gives a sketch of BOMBELLI's life and writings, and a description—illustrated by eight facsimiles—of the Ms. An analysis (p. 25-46) of the 1572 edition of the first three books follows. The interesting introduction (p. 49-51) to Book III of the Ms. precedes the annotated edition of the text of *L'Algebra parte maggiore dell'arithmetica di* RAFAEL BOMBELLI, libro quarto (p. 55-236), and libro quinto (p. 239-302). There is a short table of contents, but no index. A real and well presented contribution to the history of mathematics. A. POGO.

Paul Tannery (1843-1904).—*Mémoires scientifiques.* Publiés par J. L. HEIBERG et H. G. ZEUTHEN. IX Philologie, 1880-1928. Édité par J. L. HEIBERG. XXXIV+398 p., 5 pl. Toulouse, EDOUARD PRIVAT, 1929.

Les mémoires de PAUL TANNERY paraissent inépuisables. Le premier volume publié en 1912 fut analysé dans le premier volume d'*Isis;* le huitième, paru en 1927, fut analysé dans notre volume dix (p. 92-94). On trouvera donc quelques pages consacrées à TANNERY dans presque chaque volume d'*Isis*, sans compter bien entendu les très fréquentes allusions à ses écrits qui sont inévitables.

La constance et l'énergie de Madame TANNERY sont à peine moins admirables que l'érudition de son illustre mari. Depuis la mort prématurée de celui-ci il y a plus de vingt cinq ans, elle s'est dévouée sans relâche à la publication de ces Mémoires. Aidée dès le début par J. L. HEIBERG et H. G. ZEUTHEN, ceux-ci ont déjà rejoint leur vieil ami dans l'au-delà, ZEUTHEN en 1920, HEIBERG en 1928, mais Madame TANNERY continue sans défaillance l'œuvre entreprise.

Ce volume neuf n'est point le dernier mais c'est le dernier dont HEIBERG ait pu s'occuper. Il en avait signé un des derniers bons à tirer quand la mort est venue l'interrompre. Il est donc tout-à-fait naturel que ce volume contienne une biographie et un portrait du savant danois dont l'activité immense nous fait penser à celle des grands philologues de la Renaissance. La biographie due à J. BIDEZ de Gand complète celle que H. ROEDER publia dans *Isis* (vol. 11, 367-74, 1928); le beau portrait paraît un peu antérieur à celui d'*Isis*.

TANNERY, ZEUTHEN, HEIBERG, — magnifique trio qui restera légendaire dans l'histoire de nos études! Les Mémoires scientifiques publiés par Madame TANNERY sont une sorte de monument à la mémoire de tous les trois.

Le présent volume est intitulé assez bizarrement « philologie ». Sans doute il contient beaucoup de notes qui n'intéresseront guère que des philologues de métier, mais certains mémoires sont des contributions précieuses à l'étude de la science antique. Selon mon habitude au lieu

d'énumérer les articles dans l'ordre du livre, il me parait plus utile d'en parler dans l'ordre chronologique des sujets traités. Mais citons d'abord les études qui ne se rapportent pas à une époque bien déterminée.

Sur les âges du bronze et du fer. « Un âge du bronze correspondrait donc, non pas à l'ignorance du fer, ni même à sa rareté relative — sauf dans certaines circonstances exceptionnelles, le fer a toujours dû être plus facile à se procurer — mais bien à un état spécial de civilisation, dans lequel l'acier était ignoré ou très rare, tandis que la richesse générale était assez grande pour que les armes et les outils fussent fabriqués en bronze. » (p. 64)

Notice sur des fragments d'onomatomancie arithmétique. « L'histoire des superstitions peut parfois offrir autant d'intérêt que celle des sciences elles-mêmes ; elle peut aussi venir singulièrement en aide à cette dernière. Je réunis ici quelques documents sur un mode de divination d'après les noms propres, mode particulièrement remarquable en ce qu'il constitue un argument sérieux pour établir la connaissance chez les Grecs de la preuve dite par neuf, dont l'origine a vainement été cherchée jusqu'à présent chez les Hindous, quoique ce procédé arithmétique s'adapte évidemment beaucoup mieux au système de numération de ces derniers qu'à celui des Grecs. » (p. 17). Pour la preuve par neuf dans l'Inde, voir *Isis*, 12, 136.

Sur les abbréviations dans les manuscrits grecs.

Etudes sur les alchimistes grecs.

Chemica. Deux études consacrées aux éditions de BERTHELOT et RUELLE.

« Tous ceux qui ont examiné tant soit peu la Collection des anciens alchimistes grecs, publiée par MM. BERTHELOT et RUELLE (Paris, STEINHEIL, 1887-1888), ont pu, sur les variantes qui y sont recueillies, se rendre compte des difficultés presque insurmontables qui s'opposent, dans l'état actuel des textes de ce genre, à leur critique régulière. L'historien de la science peut sans doute, dès maintenant, essayer de tirer de ces textes tout le parti possible ; mais le philologue fera sagement, pendant longtemps encore, de se restreindre, sur ce domaine, au cercle des auteurs réellement lettrés, SYNESIUS, OLYMPIODORE, STEPHANUS D'ALEXANDRIE, PSELLUS ou encore les quelques versificateurs qui ont traité de l'*art sacré*. C'est le prudent exemple donné par M. JAHN dans le savant article qu'a publié récemment la *Revue de Philologie* (t. 15, p. 101 à 115). Voudrait-on, au contraire, aborder un écrivain aussi incorrect que paraît l'avoir été ZOZIME, par exemple, il serait tout-à-fait impossible actuellement, en présence d'une faute de grécité évidente, de discerner s'il faut la mettre au compte de l'auteur ou à celui d'un copiste, de décider en conséquence si et comment elle doit être corrigée. » (p. 151).

Inscriptions de Delphes. Deux fragments concernant des systèmes d'écriture abrégée.

Une série de cinq mémoires consacrés aux *Orphica* (nos. 26, 30 à 33, en tout 37 p.).

ASTRAMPSYCHOS. Auteur des *Oraculorum decades*, où est décrit un mode de divination tout-à-fait enfantin.

Fragments des médecins grecs. A propos d'un publication de MAX WELLMANN (1901).

Les Cyranides. Deux études (p. 311-337) dont voici la conclusion « Nous avons affaire, en présence des Cyranides, à un ensemble de textes provenant directement de sources hellénistiques, compilés au IVe siècle par HARPOCRATION D'ALEXANDRIE sous une forme littéraire que la première Cyranide seule a conservée. Longtemps après, un premier Byzantin en donna une édition dont il fit disparaître le nom d'HARPOCRATION et y ajouta trois nouveaux livres dont l'origine demeure en grande partie conjecturale ; c'est alors seulement que se forgea la légende d'un CYRANOS, roi de Perse. » (p. 337)

Sur les rapports acoustiques dans l'antiquité grecque (p. 373).

Sur le fragment astronomique des Mss. de Paris, B.N. 2844 et 2405 (p. 374).

VITRUVIUS RUFUS, § 39. Un des agrimensores représentés dans le Codex Arcerianus de Wolfenbüttel (voir mon *Introduction*, 1, 397).

Passons maintenant aux travaux dont le sujet est mieux datable.

HOMÈRE.

Le noyau de l'Iliade. « Longtemps avant l'Iliade, les aèdes hellènes chantaient les épisodes traditionnels de la guerre de Troie ; longtemps après l'époque où prit corps le poème immortel qui relie la mort d'HECTOR à la colère d'ACHILLE, il n'était encore récité que par fragments décousus. Et cependant il subsiste dans l'Iliade une unité plus frappante que dans toute autre épopée ; et cependant il est impossible d'attribuer à une collaboration anonyme l'œuvre qui reste toujours comme le modèle, imité, mais non égalé, de ce que peut rêver le génie d'un grand poète. » (p. 67).

Sur la géographie de l'Odyssée. « J'ai voulu montrer qu'il est impossibie de considérer l'auteur de l'Odyssée, comme ayant réellement situé, dans sa pensée, les pays fabuleux dont il parle; on ne peut donc pas faire, sans contradictions, une géographie de l'Odyssée, on ne peut pas dresser une mappemonde suivant HOMÈRE. On peut essayer toutefois de remonter à l'origine traditionnelle de quelques légendes et préciser plus ou moins les situations géographiques que ces légendes pouvaient supposer avant le temps d'HOMÈRE. Mais la tâche est d'autant plus difficile qu'à partir du VIe siècle avant notre ère, HOMÈRE est devenu une autorité géogra-

phique, et qu'à mesure que les connaissances positives se sont développées, la critique grecque a fait tout le contraire de ce qu'il aurait fallu pour nous éclairer. » (p. 98).

V^e siècle av. J. C.

Le procès de PROTAGORAS. Les témoignages de l'antiquité sur la condamnation du sophiste PROTAGORAS à Athènes ne reposent que sur une fiction légendaire (p. 3).

In SIMPLICII de ANTIPHONTE et HIPPOCRATE excerpta.

LEUCIPPE. Son existence est mise en doute.

HICÉTAS de Syracuse. Idem.

Première moitié du IV^e s. av. J. C.

PLATON. République, X, 616 B. C. A propos des σφόνδυλοι du passage astronomique du mythe d'Er.

ECPHANTE. « Il serait fictif dans le sens où l'est TIMÉE chez PLATON » (p. 239).

Deuxième moitié du IV^e s. av. J. C.

ARISTOTE. Météorologie, livre III, ch. V.

Aristotelica. Mechanica.

Sur HÉRACLIDE DU PONT. « Si GEMINUS a tenu à ne désigner nommément personne, à présenter le paradoxe du mouvement de la terre comme une opinion qu'il était du devoir des astronomes d'envisager, il n'ignorait pas en tout cas qui le premier avait affirmé l'immobilité du soleil et regardé la terre comme décrivant autour de cet astre une orbite circulaire excentrique. Sur ce point, tous les témoignages de l'antiquité sont d'accord; l'invention du système héliocentrique est unanimement attribuée, non à HÉRACLIDE DU PONT, mais à ARISTARQUE DE SAMOS. Comment donc la glose erronée a-t-elle pu s'introduire? »... « En tous cas, l'attribution à HÉRACLIDE DU PONT du système héliocentrique ne repose nullement sur l'autorité de POSIDONIUS ou de GEMINUS ; c'est le fait d'un annotateur anonyme d'époque inconnue, et probablement le résultat d'une simple inadvertance, trop facile à commettre : elle doit donc être considérée comme nulle et non avenue. » (p. 257-58).

Première moitié du III^e s. av. J. C.

Scholia in Elementorum librum IX.

Première moitié du II^e s. av. J. C.

ATHÉNÉE sur CTÉSIBIOS et l'hydraulis.

Première moitié du I^er s. av. J. C.

Sur la Sphérique de THEODOSIOS (p. 370).

Deuxième moitié du I^er s. av. J. C.

FRONTIN et VITRUVE.

Première moitié du I^er s. ap. J. C.

Sur deux vers de MANILIUS.

Deuxième moitié du I^er s.

Note sur l'Introduction arithmétique de NICOMAQUE.

Note sur FRONTIN (voir aussi plus haut).

La question de TACITE.

Une transposition dans le traité de PLUTARQUE sur la psychologie du Timée (p. 185).

Première moitié du III^e s.

Sur un passage de DIOGÈNE LAERCE, à propos de THALÈS.

Un passage des Philosophumena d'HIPPOLYTE.

Note sur CLÉMENT D'ALEXANDRIE (Stromat., I, 104).

CENSORINUS, De die natali.

Deuxième moitié du IV^e s.

Note sur l'ombre des pyramides. A propos d'un passage d'AUSONE : « et ipsa suas consumit pyramis umbras ».

Deuxième moitié du V^e s.

Note sur PROCLUS.

Ad MARTIANI CAPELLAE librum VII.

Première moitié du VI^e s.

CASSIODORE. Variarum III, 52.

Traduction du traité de PHILOPON sur l'astrolabe (p. 341-67). Œuvre posthume dont l'intérêt est un peu diminué par le fait qu'une excellente traduction allemande du même traité a été publiée entretemps dans *Isis* par J. DRECKER (vol. 11, 15-44, 1928). Deux planches reproduisent un astrolabe arabe du XIV^e s. conservé à l'Observatoire de Paris.

Première moitié du VIII^e s.

Fragments de JEAN DAMASCÈNE.

Deuxième moitié du XVIII^e s.

Les correspondants italiens de JEAN SCHWEIGHAEUSER.

Cette longue liste me dispense d'insister sur la richesse du volume. Je dois ajouter cependant que plusieurs de ces études sont fort courtes (2 ou 3 p.) et peu importantes. Mais quelques travaux, comme je l'ai indiqué plus haut, sont assez étendus et fort importants et tout ce que TANNERY a écrit mérite d'être lu et médité. G. S.

Kurt Vogel.—*Die Grundlagen der ägyptischen Arithmetik in ihrem Zusammenhang mit der 2:n — Tabelle des Papyrus Rhind.* Kommissions Verlag, MICHAEL BECKSTEIN, Müller, Munich, 1929, VI+211 p.

The appearance of PEET's most notable edition of the Rhind mathematical papyrus in 1923 gave a new impetus to the study of Egyptian mathematics, and since that time in this connection many new facts and ideas have been presented, by both Egyptologists and mathematicians, in numerous reviews, papers, monographs, and books. The work under

review was a recent inaugural dissertation in the philosophical faculty of the University of Munich and the field of inquiry is limited ; it is a detailed study of the 2:n table of the Rhind papyrus and of Egyptian arithmetic directly or indirectly bearing on the table.

With the single exception of 2/3, it is well known that the Egyptian had no notation for a fraction other than unity, and hence when he had to write the equivalent of 2:n, n being an odd integer, unit fractions were sought whose sum was equivalent to the quotient considered. The table in question indicates a single sum of two, or three, or four, unit fractions, corresponding to each of these values of n from 5 to 101 ; for example, n=11, 1/6 + 1/66 ; n=37, 1/24 + 1/111 + 1/296 ; and n=73, 1/60 + 1/219 + 1/292 + 1/365. The only case where the denominator of the fraction is repeated is in the last, where the equivalent of 2:101 is given as 1/101 + 1/202 + 1/303 + 1/606. Results of this table are repeatedly used in the discussions of problems which follow.

A question naturally suggesting itself is, Why was the particular set of sums in the table chosen from the infinite number available? Many conjectures and theories have been formulated in answer to this and related questions. Among writers on the subject have been : CANTOR, SYLVESTER, BOBYNIN, LORIA, HULTSCH, NEUGEBAUER, and GILLAIN. (1) Doctor VOGEL takes account of their work, as well as of that of many others, in his excellently documented study (there are about one hundred titles in the « Literaturverzeichnis », pages 207-211). The work is admirably clear, and thorough, and contains many interesting and original points of view. Let us now consider the contents more particularly.

About fifty pages of the first part of the dissertation deal with the foundations of Egyptian arithmetic and in particular with such topics as : the number system, the conception of number, addition, subtraction, multiplication, division, the unit fraction and its complementary fraction (the sum of these is unity), calculations with fractions and related metrology, and the ruling idea of proportion. In this first part and later (especially p. 185) it is argued with force that the Egyptian had the *conception* of a general fraction m/n, even though he did not have the notation for it. The author also rightly emphasizes that the ancient

(1) M. CANTOR, *Vorlesungen über Geschichte der Mathematik*, v. 1, 1880, third ed., 1907; J. SYLVESTER, *American Journal of Mathematics*, v. 3, 1880; V. V. BOBYNIN, *Bibliotheca Mathematica*, s. 2, v. 4, 1890; G. LORIA, *Bibliotheca Mathematica*, s. 2, v. 6, 1892; and *Giornale di Matematiche*, v. 32, 1894; F. HULTSCH, Sächsische Gesellschaft der Wissenschaften, *Abhandlungen*, v. 17, 1895, and *Bibliotheca Mathematica*, s. 3, v. 2, 1910; O. NEUGEBAUER, *Die Grundlagen der ägyptischen Bruchrechnung*, Berlin, 1926; O. GILLAIN, *La Science Egyptienne. L'Arithmétique au Moyen Empire*, Brussels, 1927.

Egyptian's arithmetic indicated numerous instances of his scientific intuition.

Turning to some details in this introductory section Dr. VOGEL offers on page 8, note 33, an original suggestion concerning ḥr, namely that the stroke in the corresponding hieroglyphs is the sign for unity and is to be translated by « to its 1 » or « to the 1 of me ». He does not refer to illustrations of this, but they may be found in problems 31, 33, 35, and 43.

Again, our author suggests on page 15 that in multiplication there are two forms, one of them indicating that the idea of addition is present, as « ωʾh-tp m 1 3̄ r sp 23 » meaning « operate on 1 2/3 up to 23 times », in problem 40 ; there are similar examples in problems 41 (2), 45, 46, 51, 62, 73, 74, 75. In the other form of expression for multiplication the r is omitted, as in problems 30 and 43, and there is a little more of the idea of multiplication divorced from addition.

Yet another point of view, which to me seemed new, is set forth on page 19 in connection with division where it is suggested that there are in Egyptian of the Middle Kingdom two forms of expression according as the divisor is less or greater than the dividend. VOGEL suggests that « ωʾh-tp » = « operate on » was used when the dividend was larger than the divisor ; I found this to check in problems 26, 60, 65, 68, 69 (2), 70 (2) ; it did not check, however, in problems 21, 26, 55, 56, 57, 58, and 59. Dr. VOGEL suggested also that the form of expression « nyś 2 ḫnt 3 » = « call 2 out of 3 », is used when the divisor was the larger. The above example is taken from the 2:n table of the papyrus ; other examples may be found in this same table where n is 17, 29, 41, 53, 65, 77, and 89, and also in problems 37 and 38.

Apart from the Horus eye notation for fractions 1/2, 1/4,..., 1/64 the Egyptian had a special notation for the fractions 1/2, 1/4, 1/8 when referring to portions of an arura, a unit used in measuring fields. Since in problem 53 this notation is used for 1/2, where the common notation is more naturally expected, Dr. VOGEL incidently cites the use (page 22) in illustration of the fact that fractions were first thought of by the Egyptians as portions of measures. Here as in the case of Babylonian mathematics, studies of fractions and of metrology are intimately associated.

Dr. VOGEL's originality is not so convincing when he suggests, pages 48-49, that in the table for the multiplication of fractions in problem 61 the multiplication is expressed in two forms in order to show that multiplication is commutative !

The second part of the dissertation, occupying about 140 pages, is divided into four chapters. In the first of these the general question

of expressing 2/n in terms of unit fractions of the form (x and k's are integers)

$$\frac{2}{n} = \frac{1}{x} + \frac{1}{k_1 n} + \frac{1}{k_2 n} + \cdots + \frac{1}{k_\nu n}, \quad 1 < k_1 < k_2 < \cdots < k_\nu.$$

is discussed in great detail, for the three cases $\nu = 1, 2, 3$, which are the only forms occurring in the 2/n table of the papyrus. The first, and greatest, of the fractions in the right hand member, 1/x, is called the principal fraction and the others are named remainder fractions. The principal fraction plays the chief rôle in the discussion which is often very complicated; but Dr. VOGEL is careful to note (page 93) that he has no intention of attributing any such reasoning to the ancient Egyptians, but rather has he sought to show how a systematic method of procedure leads to practically all of the resolutions in the 2/n table of the papyrus. This method of starting with a general formula, rather than with the table, is a new and interesting theoretical discussion. It is continued in Chapter 3 (pages 157-173) with special reference to exceptional cases.

The second chapter (pages 103-157) contains: (1) a detailed study of the 2/n table in the papyrus itself; and (2) a survey of its discussion by EISENLOHR, FAVARO, CANTOR, GRIFFITH, HULTSCH, VETTER, GUNN, NEUGEBAUER, BOBYNIN, and GILLAIN. In the study of the papyrus every error of the scribe is carefully noted, as well as the mistakes in PEET's edition and matters of interest in his commentary. On page 118 our author makes the interesting comment that in the cases n=19, 23, 41, and 53, auxiliary multiplications in the papyrus are indicated by shorter checking strokes than in the principal operations.

The fourth chapter is devoted to a discussion of the origin of the 2:n table and concludes with comments on the aim and mathematical content of the table and its influence on Greek and Arabic mathematics, as well as on mathematics of the middle ages.

The last 16 pages include the bibliography, and index-lists of various formulae discussed, of foreign language words, of persons and writings, of subjects, and of cited problems in the Rhind papyrus.

The whole is a work of value and great interest which, by its articulation and emphasis, illuminates in manifold directions our knowledge of Egyptian mathematics. R. C. ARCHIBALD.

Charles Homer Haskins.—*Studies in mediaeval culture.* VIII+295 p. Oxford, Clarendon Press, 1929.

Anniversary essays in mediaeval history.—By students of CHARLES HOMER HASKINS. Presented on his completion of forty years of

teaching. Edited by CHARLES H. TAYLOR and JOHN L. LA MONTE. x+417 p., portrait. Boston, HOUGHTON MIFFLIN, 1929.

The many friends and admirers of CHARLES HOMER HASKINS, Henry Charles Lea Professor of mediaeval history in Harvard University, associate editor of *Isis*, and the leading mediaevalist of the New World today, will be glad to have this collection of essays, even if they have already read some of them. Moreover three out of twelve are entirely new, and the others are not mere reprints, but revisions and amplifications. Finally these papers are not simply juxtaposed, they are correlated and their rich contents integrated and made available in a number of new ways by a very full index.

The simplest as well as the best way of reviewing a work like this is to analyze its contents, adding a few remarks here and there as the opportunity arises. In the case of papers which have been previously published, I shall always indicate the place and time of the first edition, to refresh the reader's memory and eventually to enable him to use these papers even if the present beautiful volume is not available to him.

1. *The life of mediaeval students as illustrated by their letters* (Revised and expanded from the *American Historical Review*, 3, 203-29, 1898).

2. *The university of Paris in the sermons of the thirteenth century* (Revised and expanded from the *American Historical Review*, 10, 1-27, 1904).

3. *Manuals for students* (p. 72-89). Study devoted to the *De disciplina scholarium* of the PSEUDO-BOETHIUS, which was the most popular of mediaeval manuals, the *De regimine et modo studendi quem debent habere scolares* of MARTINO DA FANO, a pupil of AZO at Bologna, and professor of law at Arezzo and Modena in 1255, the *Morale scholarium* of JOHN OF GARLAND (1241), the *Manuale scholarium* of c. 1480 (*Isis*, 4, 407), and other writings of the same kind.

4. *The spread of ideas in the Middle Ages* (Reprinted from *Speculum*, 1, 19-30, 1926). See *Isis*, 9, 182.

5. *The Latin literature of sport* (Revised from *Speculum*, 2, 235-52, 1927). Dealing with treatises on tournaments, and with those on the chase and falconry, to which the author had already paid much attention in his *Studies in the history of mediaeval science* (1924; *Isis*, 7, 121-24; new edition, 1927). « Fishing, on the other hand, has left no similar litarary remains from our period, for it was not a recognized sport of the upper classes. There was, of course, the example of ST. PETER—did not the Popes seal their breves *sub annulo piscatoris ?*—and fish were a necessity during Lent, but neither the castle and monastery fish ponds nor the great herring fleets of the North tempted a mediaeval IZAAK WALTON to discourse upon angling as a fine art. Nor did the Middle

Ages take kindly to other forms of aqueous diversion.» Finally a few texts on chess are briefly examined.

6. *Latin literature under* FREDERICK II (Revised from *Speculum*, 3, 129-51, 1928).

7. *The alchemy ascribed to* MICHAEL SCOT (Except for the opening and concluding paragraphs, this chapter is reprinted substantially unchanged from *Isis*, 10, 350-59, 1928).

8. *Contacts with Byzantium.*—A Canterbury monk at Constantinople, c. 1090 (*English historical review*, 25, 293-95, 1910). CHRYSOLANUS OF MILAN (*Mediaeval science*, p. XIII, 195-97 ; *Byzantion*, 2, 234-36, 1926). PASCHAL THE ROMAN (*Mediaeval science*, p. XIII-XIV, 218-21 ; *Byzantion*, 2, 231-34, 1926).

9. *The early Artes dictandi in Italy*. This is a new study, but it embodies material used in two others : An early Bolognese formulary (Mélanges Pirenne, 1926 ; *Isis*, 10, 124) and An Italian master BERNARD (Essays presented to R. L. POOLE, 1927), together with abundant new ones. It is in fact a survey of Italian treatises on the *ars dictaminis* to c. 1160.

10. *Robert le Bougre and the beginnings of the inquisition in northern France*. (Revised from the *American Historical Review*, 7, 437-57, 631-52, 1902).

11. *The heresy of* ECHARD *the baker of Rheims*. «Of the two principal groups of heretics in Western Europe in the Middle Ages, Dualists and Waldenses, the Waldenses are decidedly the more obscure. Being both less numerous and less conspicuous, they appear more rarely in the documents and theological writings of the period ; indeed their teaching seems to have spread chiefly among the lower classes, and they rarely rise to the surface in such a way as to leave a record of their doctrines or their geographical distribution. Particularly little is known of the Waldenses in the North of France ; in FREDERICQ's great collection of documents relating to heresy in the Low Countries and adjacent French lands the cases reported are almost exclusively Manichean. It is accordingly not without interest to note a well defined instance of Waldensianism at Rheims about 1230, especially as it shows us an example of the pursuit of heretics just before the introduction of the papal Inquisition and brings to light a noteworthy provincial council otherwise unknown. Moreover, the chief heretic, ECHARD, was a baker by trade and thus gives us a glimpse of a social class not often mentioned in this period.» ECHARD was condemned for heresy by a provincial council (in Remensi synodo) and burnt ; at the same time that council forbade translation of the Bible into French. «It is curious that no other record is left of a matter of such permanent importance as the council's prohibition of Romance versions of the Scriptures. Vernacular translations

of portions of the Bible are mentioned in connexion with the Waldensian troubles at Metz in 1199 and appear also at Liége in 1202 and at Trier in 1231, as well as at Rheims, but while they are forbidden by the council of Toulouse in 1229 and by an act of the king of Aragon and his bishops in 1234, no other record of such action has been found in the North of France. »

12. *Two American mediaevalists.* Obituaries of HENRY CHARLES LEA (1825-1909), the great historian of the Inquisition, and of CHARLES CROSS (1857-1909), whose best known work is *The sources and literature of English history to c.* 1485 (1900 ; 1915).

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Another view of Professor HASKINS's splendid activity is given in the bibliography of his writings, compiled by GEORGE W. ROBINSON, and appended to the Festschrift recently dedicated to him. It is a long and impressive list representing forty years of labor and devotion (1891-1929). And of course it is already incomplete ; for example, it does not contain the book which has just been reviewed, nor, let us hope, many more to come. The collaborators to this Festschrift were exclusively old students, or else it would have been much larger. It contains eighteen essays. As many of these do not fall within our field, we shall not enumerate them, but a few of them will be included in our next critical bibliography. This is we believe the best way of bringing them to our readers' attention. Festschriften are very well in certain respects ; they afford a fine opportunity for students to express their gratitude to a beloved master ; but it cannot be denied that the writings included in them are generally less known and less available than if they had been published in one of the leading historical journals. Those who are fortunate enough to own a copy of these Anniversary essays will be pleased with the beautiful portrait forming its frontispiece. Wherever they may be it will help them to remember more concretely a great scholar and a teacher who succeeded in inculcating on at least a few students the best traditions of learning and humanism. GEORGE SARTON.

Gottfried Müller. — *Aus mittelenglischen Medizintexten; Die Prosarezepte des Stockholmer Miszellankodex X*, 90. Kölner Anglistische Arbeiten herausgegeben von HERBERT SCHÖFFLER, Band X, Leipzig, Verlag von BERNHARD TAUCHNITZ, 1929. (15 marks)

This work continues the editing of Middle English medical recipe manuscripts which began with FRITZ HEINRICH's *Ein mittelenglisches Medizinbuch*, Halle, 1896, in which was published a British Museum manuscript of the year 1328, Additional 33996, and was continued

in GEORGE HENSLOW's *Medical Works of the Fourteenth Century*, London, 1899, where appeared the English portion of a manuscript in the editor's possession and excerpts from three other manuscripts of the British Museum, Sloane 521 and 2584, and Harley 2378. The present work edits the prose recipes in a Stockholm manuscript, Miscellankodex X, 90, where they are found largely in hands of about 1400 A.D., though a small section is in writing of about 1450. Portions of this Stockholm manuscript were published nearly a century ago by GEORGE STEPHENS, « Extracts in Prose and Verse from an Old English Medical Manuscript, perserved in the Royal Library at Stockholm », in *Archaeologia*, vol. XXX (1841), p. 349 et seq. They were re-published in a better form by HOLTHAUSEN in *Anglia*, XVIII, 295-331 ; XIX, 77-85. The present edition aims at a complete and definitive text of the prose recipes.

The work obviously has a double interest and value : the linguistic, for students of Middle English, and that of content for students of folklore and the history of medicine. Of the scholarly introduction, after the codex utilized has been described, pages 13 to 22 are devoted to a discussion of peculiarities in linguistic form and usage. Pages 22 to 26 then discuss the contents and the problem of what Latin or other sources were made use of. As in COCKAYNE's *Leechdoms*, charms and magic are of not infrequent occurrence in these recipes. They are closely related to those already published by HEINRICH and HENSLOW from other manuscripts ; often the very words are the same. Such resemblances and differences are indicated by Dr. MÜLLER in the abundant footnotes which accompany the text. Not the least valuable feature of the edition is the elaborate Register or Glossary which follows the text and occupies pages 140-210. A useful bibliography concludes the volume, which is very attractively printed.

This is a work which will be useful to students of the Latin medicine and recipes of the medieval period as well as to specialists in Middle English.

LYNN THORNDIKE.

René Grousset.—*Histoire de l'Extrême-Orient*. 2 vols. x+769 p., 32 pl., frontispice, 7 cartes. Paris, GEUTHNER, 1929 (250 frs.).

Cet ouvrage n'est pas une réédition de l'*Histoire de l'Asie* du même auteur (3 vols., Paris, 1922 ; *Isis*, 6, 188). C'est à la fois plus et moins. Moins parce qu'il ne s'agit plus ici que de l'Extrême-Orient (sauf le Japon !), et non de toute l'Asie ; plus, beaucoup plus, parce que le sujet a été approfondi considérablement.

C'est une œuvre tout à fait remarquable, une vraie gageure. On ne sait de quoi il faut le plus s'étonner, de l'érudition complexe de l'auteur, de sa curiosité infinie, de sa facilité à énoncer simplement et fortement

l'essentiel de chaque question. Songez donc que nous avons ici une histoire de l'Inde des origines à la fin du moyen âge en 174 pages ! (Et cela comprend des notes sur l'empire sumatranais de Çrîvijaya et les royaumes javanais). Puis une histoire de la Chine des origines à la fin des Song en 228 pages. Les chapitres suivants, consacrés à l'empire mongol, à la Chine des Ming et des Mandchous, et à l'Indochine comportent respectivement 91, 52, et 75 pages. Et qui plus est, il ne s'agit pas ici simplement d'histoire politique. Le cadre est politique, mais le but est celui de l'histoire religieuse et artistique. L'auteur semble s'être proposé de ne raconter les vicissitudes de ces peuples que dans la mesure où un historien de l'art et un conservateur de musée désirent les connaitre. Cela est fort bien, — mais seulement jusqu'à un certain point.

Il est certain que l'histoire de l'art nous donne une des meilleures clés pour la connaissance de l'Asie bouddhique. J'ai développé ce point de vue assez longuement ailleurs pour devoir y revenir ici (1). Mais ce n'est là qu'une clé, et elle n'ouvre pas toutes les portes, loin de là. L'auteur a le droit de délimiter sa tâche comme il lui convient, mais il devrait nous prévenir ; à vrai dire s'il ne l'a point fait, c'est qu'il n'a guère soupçonné un autre aspect essentiel de l'histoire de l'humanité — le développement de la pensée scientifique et de la technique. Il a bien compris la vertu explicative de l'histoire des religions, mais il n'a attaché aucune importance à l'histoire de la science, ou plus exactement il n'en a pas parlé du tout, il l'a traitée comme si elle n'existait pas. (La seule exception peut-être est sa discussion, d'ailleurs fort sommaire, du hsing-li — des idées cosmologiques des néo-Confucianistes, particulièrement de CHU HSI). C'est là sans doute une grande erreur que la pauvreté de nos connaissances excuse sans la justifier.

On nous objectera peut-être que l'histoire des sciences est encore une discipline très spéciale, et que si les historiens de la pensée occidentale se permettent généralement de l'ignorer, il faut bien pardonner à un historien de l'Asie de suivre leur exemple. Soit, mais l'auteur a commis une faute beaucoup plus grande dont il sera presque impossible de l'absoudre. Il appelle son histoire, une Histoire de l'Extrême Orient, mais la belle promesse de ce titre n'est point tenue. Une vraie histoire de l'Extrême Orient n'est pas seulement la somme d'histoires particulières ; le titre implique une intégration qui n'a pas été accomplie. Serait-il légitime d'intituler Histoire de l'Europe un livre qui contiendrait un résumé de l'histoire de l'Angleterre, suivi d'autres résumés consacrés à la France, l'Allemagne, etc.? Certes non. Ceci me choque d'autant plus que j'ai passé toute ma vie à prouver que l'histoire de la science

(1) Art as an approach to Asia, in *Yale Review*, April 1926 (*Isis*, 9, 185).

est bien plus que la somme d'histoires des sciences particulières, comme l'écrivit par exemple WILLIAM WHEWELL dans son *History of inductive sciences* (3 vols., London, 1837). Or l'analogie est complète. Une histoire de l'Extrême Orient devrait nous expliquer pas à pas l'évolution parallèle de tous ces peuples, ce n'est qu'ainsi que cette histoire aurait toute sa valeur explicative. Certes, elle ne serait pas facile à composer, — mais la tâche n'est pas impossible, et M. GROUSSET serait peut-être mieux préparé que n'importe qui pour l'entreprendre.

Il s'est d'ailleurs rendu compte de la faiblesse de sa méthode. A la p. 334, il nous avoue qu'on ne peut être complet en parlant de l'art bouddhique en Asie Centrale et en Chine sans étudier le prolongement de cet art en Corée et au Japon, — or le Japon est exclu de cette extraordinaire histoire de l'Extrême Orient, — ou remis à plus tard ! Quoique je n'écrivisse point l'histoire de l'art où de tels rapprochements eussent été beaucoup plus clairs, j'ai montré plusieurs fois dans le premier volume de mon *Introduction* que le rythme de la pensée japonaise a toujours suivie de très près celui de la pensée chinoise. Mais comment faire voir ces parallélismes, qui sont les plus impressionants spectacles de l'évolution humaine, si l'on brise artificiellement l'humanité en tronçons disjoints ? Sans doute les différences et les disjonctions sont-elles évidentes, et l'on conçoit qu'un historien de l'Inde ou qu'un historien de la Chine s'y trompe, mais celui qui n'aperçoit pas que les ressemblances sont malgré tout plus grandes que les différences, et les raccords plus nombreux et plus importants que les séparations ne devrait pas se mêler d'écrire une histoire de l'Extrême Orient. Quand on se tient terre à terre, on ne se rend compte que des jalousies, des rancunes, des conflits — car ceux-ci sont plus bruyants et plus nombreux. L'humanité est divisée par les esprits médiocres qui forment la grande majorité. Mais si l'on s'élève plus haut, on s'aperçoit que toutes ces désharmonies sont compensées et en quelque sorte abolies par l'union des grandes âmes. Celles-ci poursuivent sous des formes bien différentes le même idéal religieux, artistique, scientifique. L'Extrême Orient, c'est en somme l'Asie bouddhique, et voilà une grande synthèse, le Bouddhisme. L'art en est une autre, car si l'on s'en tient à cette Asie bouddhique, l'unité essentielle de son art est évidente. Les économistes nous ont montré tous les liens commerciaux dans lesquels ces peuples étaient enchevêtrés, et j'ai moi-même essayé de démêler les multiples idées scientifiques qui devinrent graduellement leur patrimoine commun. Bien entendu M. GROUSSET n'ignore pas tout cela. Sauf l'histoire des sciences qui n'existe pas pour lui, il a parfaitement bien compris l'unité religieuse, philosophique et artistique de l'Extrême Orient, mais il n'en reste pas moins vrai que le cadre de son exposé est aussi maladroit que possible.

L'auteur étant Conservateur adjoint au Musée Guinet, il n'est pas étonnant qu'il se soit surtout intéressé à la religion et à l'art. Les meilleures pages de son livre sont consacrées à ce dernier, et je voudrais en donner quelques extraits pour que le lecteur puisse le voir sous son jour le plus favorable.

Tout d'abord son appréciation de l'art gandhârien me parait une juste mesure entre deux extrêmes (p. 83). « On doit reconnaître à l'actif du gréco-bouddhique un mérite essentiel, celui d'avoir donné le signal de la figuration du Buddha et fait cesser le paradoxe de scènes de la vie du Bienheureux sans le Bienheureux. Certes, nous n'avons pas dissimulé nos préférences esthétiques pour l'art de Sâñchî qui, en dépit de son perpétuel symbolisme, nous paraît, dans les scènes de la vie du Buddha, infiniment plus spontané, plus ému, plus vivant que la représentation effective des mêmes scènes au Gandhâra. Il n'en reste pas moins que l'obligation de remplacer par des symboles l'image du Bienheureux entravait considérablement le développement de l'iconographie bouddhique. Là encore l'art du Gandhâra a rendu au Bouddhisme un immense service : non seulement il a créé le type du Buddha, le type de Maitreya, le type de Vajrapâni, etc., mais il a constitué et définitivement arrêté, dans ses innombrables bas-reliefs, l'ordonnance générale, le thème iconographique des divers cycles et des diverses scènes de la vie du Bienheureux. A cet égard l'art bouddhique tout entier, du Japon en Asie Centrale, du Tibet à Java, n'a fait, depuis, que répéter la leçon des ateliers gandhâriens ». Cette tâche accomplie, l'art gandhârien, dont l'essence était étrangère à l'âme indienne, a dégénéré rapidement. On pourrait comparer son action à celle d'un catalyseur.

A propos de l'art gupta, il remarque (p. 139) : « Cette esthétique indienne suppose sans doute une pensée qui a connu le canon hellénique, mais qui ne l'a connu que pour s'en affranchir et créer elle-même un canon égal. En effet, en se libérant du classicisme grec, devenu ici un poncif, l'art gupta a produit un classicisme nouveau, vivant celui-là, parce que né des conditions mêmes du milieu. L'art gupta tire les règles de sa plastique non seulement de la connaissance du vêtement indien et des conditions de la vie subtropicale, mais de la science du corps indien lui-même. »

Et l'art khmèr lui suggère entre autres les réflexions suivantes (p. 577) : « Le canon indo-classique — gupta ou pallava — ne tarda pas, chez les Khmèrs, à se modifier insensiblement sous l'influence indigène. Le type aryen des statues fit place au type indochinois — face courte, tempes accentuées, yeux bridés, nez aplati, lèvres épaisses — ou plutôt il l'admit à côté de lui. Ce serait d'ailleurs une erreur de croire que l'adoption de ce type ait immédiatement coïncidé avec une décadence esthétique.

Tout au contraire. Ce facies indigène était peut-être moins pur que le facies aryen, mais les artistes khmèrs le rendent évidemment avec plus de vérité et de vie. Aussi, lorsqu'il s'éclaire à son tour de l'ineffable sourire bouddhique, on a les œuvres à la fois les plus savoureuses et les plus profondément émouvantes de l'art cambodgien. » Cela est fort bien dit. A ce propos, je pense que la partie de son livre consacrée à l'Indochine sera sans doute la plus utile, car il ne nous manque pas d'histoires de l'Inde et de Chine, mais une synthèse indochinoise nous faisait défaut ; celle-ci parait fort bien conçue.

Il y a une longue bibliographie (p. 623-84), mais elle laisse beaucoup à désirer. Elle semble avoir été rédigée trop hâtivement ; beaucoup de noms et de titres sont cités incomplètement ; souvent on a l'impression qu'ils l'ont été de seconde main. Quand on cite l'histoire des Mongols de Sir HENRY H. HOWORTH, il faudrait mentionner le volume d'appendices et d'index qui la complète (vol. 4, 1927 ; *Isis*, 11, 501). L'auteur ne parait pas avoir attaché lui-même beaucoup d'importance à cette bibliographie, puisqu'il ne l'a pas indexée, mais alors pourquoi l'a-t-il publiée ? On ne peut s'empêcher de penser qu'elle a été ajoutée à la dernière heure pour grossir le volume. Je me hâte de dire que des indications bibliographiques beaucoup plus précieuses sont contenues dans les notes. Celles ci sont extraordinairement riches et variées.

Il me reste à parler de deux qualités de cet ouvrage qui en augmentent considérablement la valeur. D'abord il contient une série de sept cartes historiques de très grand format qui mériteraient d'être publiées dans un atlas séparé. Il y aussi de fort belles planches, mais comme celles-ci représentent des monuments bien connus, elles ne sont pas aussi nécessaires, tout au moins pour les lecteurs avertis. En second lieu les noms arabes et persans de la période mongole sont donnés dans l'écriture arabe, et ce qui importe beaucoup plus, les noms chinois et indochinois sont donnés en caractères chinois. L'index parait établi avec beaucoup de soin, et des chiffres italiques permettent de retrouver de suite les caractères chinois ; cela est une pensée très heureuse. Toute une série de transcriptions sino-sanskrites pour l'histoire des pélerinages bouddhiques, la géographie et la religion sont données (p. 168-74).

En somme, en dépit de ses défauts incontestables, le livre de M. GROUSSET sera des plus utiles. C'est un grand pas en avant. Il est admirablement publié par la maison GEUTHNER qui mérite toute notre reconnaissance pour sa libéralité, car malgré les belles cartes et planches et les caractères achinois, le prix en est fort modique.

GEORGE SARTON.

Alexandra David-Neel.—*Mystiques et magiciens du Thibet.* Préface de

A. D'ARSONVAL. 25 gravures hors texte. VI+306 p. Paris, PLON, 1929 (20 frs.).

Alexandra David-Neel.—*Voyage d'une Parisienne à Lhassa.* A pied et en mendiant de la Chine à l'Inde à travers le Thibet. 28 photographies hors texte et une carte. XII+332 p. Paris, PLON, 1927 (18 frs.).

When I dedicated volume twelve of *Isis* to the memory of the great Hungarian scholar, ALEXANDER CSOMA de Körös (see that vol., p. 5-9), and spoke of the sufferings he had so patiently endured in the Himalayas for the sake of his Tibetan studies, I did not realize that there was now living a French woman whose heroism was at least equal to his. The almost unbelievable narrative of her long journey afoot from eastern China across Tibet to Lhasa and then down to India in the garb of an old beggar is one of the best stories of travel I have ever read, and Mme. ALEXANDRA DAVID is certainly one of the pluckiest women who ever lived. Her account, first published in French, was soon translated into English (*Isis*, 11, 222, or 12, 402) and into German (*Isis*, 14, 522), which means that it is now available to almost every educated person in the West. I did not review it in *Isis* as it was outside our field, but a new work of hers gives me a very welcome opportunity to discuss her achievements.

She learned to speak fluently various Tibetan dialects, one of her masters being the late Lâma KAZI DAWA-SAMDUP, he who Englished the Tibetan « Book of the dead » (1927, *Isis*, 11, 502). The first chapter of her new book contains very curious reminiscences of that extraordinary character. DAWA-SAMDUP conducted a school in Gangtok, Sikkim, of which she gives an amusing description ; when he died not long ago he was professor of Tibetan in the University of Calcutta.

Mme. DAVID visited many monasteries in Tibet and noticed that it was always the school of ritual and magic (*rgyud*, corresponding to the Sanskrit *tantra*) which had by far the best accomodations, and that the students of *rgyud* were generally esteemed above the others. Her book is full of valuable observations concerning a number of subjects which westerners would be tempted to call magical. Take, e.g., levitation. There are in the « Snowland » certain men *(lung-gom-pa)* who have trained themselves, partly by psychical means, to run for considerable distances at a very high speed without rest or food. Some of these men have become so light that they feel obliged to carry heavy chains to ballast themselves !! The point of interest is that their training is at least in part psychical. Indeed it is the same sort of training practised by Hindu *yogis;* in both cases the main effort is centered upon the regulation of respiration. Would the many excercises which they make for that purpose finally enable them to control the sympathetic nervous

system? Their attainments are undoubtedly astounding. It would be worth while to compare Mme. DAVID's account with that recently given by G. VASANT RELE in *The mysterious Kundalini* (Bombay, 1927, 2nd edition 1929). I have not seen RELE's book myself, but it was reviewed for *Isis* by Col. J. STEPHENSON (vol. 11, 224).

To return to the present volume, one of the most interesting sections deals with *gtumo*, the method of heating oneself by sheer spiritual concentration! Let me quote a few paragraphs of this:

« Passer l'hiver dans une caverne située, souvent, entre 4000 mètres et 5000 mètres d'altitude, vêtu d'une robe mince ou même nu et ne pas périr gelé, est un problème compliqué. Nombre d'ermites thibétains l'ont pourtant résolu et leur endurance est attribuée au fait qu'ils possèdent le moyen de stimuler la chaleur interne appelée *toumo*. Le mot *toumo* signifie chaleur, mais il n'est pas employé dans le langage courant pour désigner la chaleur ordinaire. C'est un terme technique de la terminologie mystique, et les effets de la chaleur mystérieuse dénommée ainsi, ne sont pas confinés à réchauffer le corps des ascètes capables de l'engendrer. Les adeptes des sciences secrètes thibétaines distinguent différentes sortes de *toumo*. *Toumo* exotérique qui surgit spontanément pendant certaines extases et, graduellement, enveloppe le mystique dans le « doux et chaud manteau des dieux ». *Toumo* ésotérique qui vient d'être mentionnée et assure le confort des ermites sur les montagnes neigeuses. *Toumo* mystique qui ne peut prétendre qu'à une très distante parenté avec l'idée de ' chaleur ', car elle est décrite comme faisant éprouver, dans ce monde, les ' délices paradisiaques '. Dans l'enseignement secret, *toumo* est aussi le feu subtil qui réchauffe le fluide génératif et fait monter l'énergie latente en lui, le long des canaux filiformes des *tsas* jusqu'au sommet de la tête, procurant au lieu de plaisir charnel, des délices intellectuelles et spirituelles. »

I hasten to say that the author does not share these fantastic physiological ideas—she simply explains them as they were explained to her—but she believes to some extent in *gtumo* and seems to have some good practical reasons for her belief. To illustrate her own point of view I may quote also her final paragraph:

« L'étude des phénomènes psychiques doit, il me semble, s'inspirer du même esprit que n'importe quelle recherche scientifique. Les découvertes que l'on peut faire dans ce domaine n'ont rien de miraculeux, rien qui puisse justifier les croyances superstitieuses et les divagations auxquelles certains se sont abandonnés à leur propos. Bien au contraire, ces recherches tendent à mettre au jour le mécanisme des prétendus miracles et le miracle expliqué n'est plus un miracle. »

The outstanding conclusion one cannot help drawing from such record is that Western men have been so busy trying to dominate matter that they have never seriously tried to dominate their own bodies. The not uncommon spectacle of one of our so-called « big men » reduced to impotence by a little toothache would be ludicrous if it were not so

pitiful. The modern western man is so afraid not only of pain but of mere discomfort that he is in a serious danger of becoming a coward. This is the result partly of his habit of relieving pain as soon as possible and of his growing impatience with it, partly of this materialistic philosophy. As opposed to him, the conscious Buddhist, for whom the material world, together with all its pleasures and pains, is nothing but a subjective and fleeting vision, finds it relatively easy to conquer his fears, or even to annihilate them. Mme DAVID'S courage is due to her Buddhist faith, or more exactly to her Buddhist wisdom. On that account there is much to be learned in her books, perhaps even more in the first than in the second. There is no need of warming ourselves by psychical efforts, but we may all learn to become more or less insensible to pain—especially to unavoidable pain, physical or moral—by sufficient concentration away from it. Her achievement is a lesson to us all. As the Arabs put it, it is an example ('ibrat) for those who learn by the example of others,—but who does? GEORGE SARTON.

Alois Musil. —*The manners and customs of the Rwala Bedouins.* American Geographical Society, Oriental explorations and studies no. 6. Edited by J. K. WRIGHT. XIV+712 p., 59 fig. New York, American Geographical Society, 1928 (eight dollars).

The author of this monograph is well known among geographers, ethnographers, and students of Arabia. In 1895, he was already carrying on Biblical and Semitic studies in Jerusalem, and in the following year —that is, thirty four years ago !—he began his long series of explorations. In the meanwhile he continued his study of Hebrew and Arabic. His first great work was the Arabia Petraea published by the Imperial Academy of Austria (vol. 1, Moab ; vol. 2 in two parts, Edom ; vol. 3, Ethnologischer Reisebericht, Vienna, 1907-08). In 1908-15, he undertook a new extended journey of exploration, this time in Arabia proper, and his itineraries and observations were published by the American Geographical Society of New York under the patronage of the Czech Academy and of CHARLES R. CRANE and the editorship of J. K. WRIGHT (one of the associate editors of *Isis*). In all 6 volumes have appeared : I. The Northern Ḥejâz, 1926 (*Isis*, 10, 249) ; II. Arabia Deserta, 1927 (*Isis*, 10, 249). This is the Arabia Deserta of the ancient authors ; CHARLES M. DOUGHTY'S famous Travels in Arabia Deserta (1888) really referred to a part of Arabia Felix. III. The Middle Euphrates, 1927 (*Isis*, 11, 491) ; IV. Palmyrena, 1928 ; V. Northern Najd. The VIth and last volume is the one now under review.

This sixth volume corresponds in general scope to the fourth volume of Arabia Petraea (1908). It would be interesting to compare them.

This cannot be done here ; it will suffice to remark that the earlier work contains more information on the tribes themselves.

The present volume, dedicated to President MASARYK, is a very elaborate and very technical description of the manners, customs, and lore of the Rwala Bedouins. The table of contents will give us an idea of its comprehensiveness : 1. The heavenly bodies and the weather ; 2. Animals ; 3. Structure of society ; 4. The tent and its furnishings ; 5. Food ; 6. Dress and weapons ; 7. Marriage customs ; 8. Children ; 9. Strangers in the camp ; 10. Poetry ; 11. Camels ; 12. Horses ; 13. Omens ; 14. Supernatural gifts ; 15. Spirits and vows ; 16. Judicial procedure ; 17. Protection of the oppressed ; 18. Hospitality ; 19. Personal qualities ; 20. Vengeance ; 21. War and Peace ; 22. Laws of inheritance ; 23. Death and after death ; 24. Terms applied to physiographic features.

The author has apparently derived the totality of his knowledge from his own observations, for I did not find a single literary reference. In all probability he received some help from learned shuyûkh, such as the one, al-shaykh Mûsâ, whose portrait is published as frontispiece. The minuteness of his observations and the scientific tone of his record give us considerable confidence. All the technical terms are quoted in Arabic ; the author's transcription is inconvenient to English readers, but it is consistent, and that is the essential. Many Arabic poems are quoted in full, not only in the long chapter on poetry (p. 283-328) but throughout. It is regrettable that these poems were not printed in Arabic type ; indeed the transcription is of no use to non-Arabists and very embarrassing to the Arabists ; the latter are so-to-say obliged to recreate the Arabic script and visualize it in order to understand what they are reading. The printing of Arabic type is now easy enough in New York, it can even be adapted to the linotype. (1) The transcription in Roman type is of course necessary and sufficient for technical terms or short quotations; on the contrary for longer texts it is unnecessary and insufficient. To conclude my remarks on Arabic, it is also to be regretted that the Arabic index is not more elaborate (in this respect the Vienna volume was superior). For example, the Arabic names of animals are mentioned in the text, but not included in the index. For some strange reason, the Arabic names of plants were treated more generously, and whenever possible they have been followed with the corresponding Latin names as determined by J. VELENOVSKY (*Plantae arabicae ex ultimo itinere* A. MUSILI a. 1915, Prague 1923 ; *Plantae arabicae Musilianae*, Prague, 1912).

(1) A very handsome catalogue of Arabic linotype has been issued by the Mergenthaler Linotype Company of Brooklyn, New York, in 1929. A work of AL-SUYÛṬI's was recently printed with the linotype (New York, 1927; see *Isis*, 13, 440).

I was especially interested in the chapters dealing with camels and horses, and was very much pleased to find in them some illustrations I had been longing for for a long time, i.e., diagrams (figs. 35, 49) showing the different parts of a camel (or of a horse) with the corresponding Arabic terms. For the camel not less than 61 terms are thus given. Students of Arabic who are overwhelmed by the endless camel vocabulary will find these diagrams very useful. There are also many other drawings, which enable us to visualize the things which are behind the words more completely; for example, figures of a water hoist, maqâm; various kinds of saddles and saddle cushions; a camel halter, rasan; a loom, naṭw; qenn litters; a water trough, ḥawẓ; etc. To return to camels, the chapter relative to them is subdivided as follows: camels of different ages and kinds; pasturing of camels; watering of camels; ditties sung when camels are watered; lost camels; value and uses of camels; camel saddles; camels on the march; songs relating to camels; drinking from a camel's paunch; diseases of camels.

Historians of medicine will find grist for their own mill in the chapters on camels and horses, and in the final one, on death. The medical section is unfortunately very much shorter (p. 666-70) than we would wish, yet it includes a long list of diseases, wounds, and their cures. Finally the list of terms applied to physiographic features will be very useful. The purely lexicographical value of the work is considerable, and the lack of an Arabic index is the more to be pitied.

In short, we owe the author—and all those who have helped him to publish his results in such clear and handsome wise—much gratitude for an excellent encyclopaedia of Bedouin life and lore.

GEORGE SARTON.

Robert A. Millikan.—Science and the New Civilization. 194 p. New York, SCRIBNER'S, 1930 ($ 2).

Norman Foerster (*editor*).—Humanism and America. Essays on the outlook of modern civilisation. XVII+294 p. New York, FARRAR and RINEHART, 1930 ($ 3.50).

The first book is a collection of addresses previously published in various magazines, and which carry the same essential message: a defense of scientific knowledge against its detractors. The titles are: 1. Science and modern life; 2. The relation of science to industry; 3. Alleged sins of science; 4. Available energy; 5. The last fifteen years of physics; 6. The future of steel; 7. MICHELSON'S economic value; 8. Three great elements in human progress. To analyze the essays is naturally out of the question; it would simply spoil the reader's pleasure in reading them. It will suffice to remark that very few men to-day

are as well qualified as the author is to discuss these momentous problems. Our only regret is that the very people who need MILLIKAN's advice most will in all probability not bother to take it.

I was especially interested in the last lecture. Let me quote the first paragraph (p. 166) which sets forth its argument.

« These are three ideas which seem to me to stand out above all others in the influence they have exerted and are destined to exert upon the development of the human race. They have appeared at widely separated epochs because they correspond to different stages in the growth of man's knowledge of himself and of his world. Each of these ideas can undoubtedly be traced back until its origins become lost in the dim mists of prehistoric times, for the sage and the prophet, the thinker and the dreamer, have probably existed since the days of the caveman, and the first has always seen, the second felt, truth to which his times were wholly unresponsive. But it is a general rule that *when the times are ripe* an idea that may have been adumbrated in individual minds millenniums earlier begins to work its way into the consciousness of the race as a whole, and from that time on exerts a powerful influence upon the springs of human progress. In this sense, these three ideas may be called discoveries and times may be set at which they begin to appear. The first of these, and the most important of the three, is the gift of religion to the race; the other two sprang from the womb of science. They are (1) The idea of the Golden Rule; (2) The idea of natural law; (3) The idea of age-long growth, or evolution. »

The theory (referred to on p. 90) according to which there were more apocalyptic fears connected with the year 1000 A.D. than with any other has long been exploded. See my *Introduction* (vol. 1, 734). The word entropy is twice mispelled entrophy (p. 115, 116).

The author of this stimulating book, ROBERT ANDREWS MILLIKAN is known at the moment (1930) chiefly as the discoverer of cosmic rays, vibrations one hundred times more penetrating than X-rays. Some will remember that he was one of the leading enunciators of the statement, made just a few years ago, that there is no valid quarrel between science and religion. Others will recall that in 1923 MILLIKAN received the Nobel Prize in physics for his work in isolating and measuring the fundamental electrical charge of matter, i.e., the electron. Born on March 22, 1868, at Morrison, Illinois, he is the son of a Congregationalist minister. During his student days at Oberlin College his interests were Greek and mathematics, and it was not until he was tutoring at that institution that he became absorbed in physics. His passion for this learning was so deep that he became an associate professor of that subject, and in 1910 went to the University of Chicago as professor of physics. There he did some of his most important experimental work. In 1921, he was made director of the Norman Bridge Laboratory of Physics of the

California Institute of Technology. Several years later he was made executive chairman of the Institute.

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The second book edited by NORMAN FOERSTER, professor of English in the University of North Carolina, will be best defined by the statements on its jacket.

« The challenge of culture to the anarchy of our own times ! » — « The new decade begins with a vigorous ' call to order ' by leaders in American thought who are too modern in their positive and experimental spirit to be called reactionary and who yet are too steeped in tradition to be indiscriminate revolutionists. The New Humanists appear in force at the same time with similar risings of classical spokesmen abroad. They are linked in essentials though not in detail with those spirited upholders of orthodoxy in England, G. K. CHESTERTON and HILAIRE BELLOC, and with those polished critics in France, CHARLES MAURRAS, JACQUES MARITAIN and HENRI MASSIS. Not the least conspicuous feature of the new humanist movement is the appeal it makes to youth and the support it has won from youth. »

It begins with a long attack on science « The pretensions of science » by LOUIS TRENCHARD MORE, professor of physics and dean of the graduate school of the University of Cincinnati. MORE develops the old theme which would be called in French « la banqueroute de la science ». It is rather amusing to notice the recurrence of rhapsodies on that theme at the very moments when science is as healthy and as vigourous as can be, while much of contemporary literature and art shows unmistakable symptoms of disease and decay. The main impression which the reader receives is one of chaos. Some essays are very well written, but they do not form an harmonious whole, far from it, and whatever harmony there may be is stupidly jeopardized by the editor's preface. Think of a movement claiming to represent urbanity, measure, etc., that places itself under the simultaneous patronage of HOMER, PHIDEAS (sic !), PLATO, ARISTOTLE, CONFUCIUS, BUDDHA, JESUS, PAUL, VIRGIL, HORACE, DANTE, SHAKESPEARE, MILTON, GOETHE, MATTHEW ARNOLD, EMERSON and LOWELL ! One wishes one could send some of these « humanists » back to school that they may learn the A B C of science, and be taught how dishonest it is to condemn things of which one knows nothing. The best essay is the one by IRVING BABBITT, but it is clear enough that for BABBITT, as for his colleagues in « humanism », the terms « scientific » and « utilitarian » are almost synonymous, which is enough proof that he does not know what science is.

To return to the scientific contributor, whose essay was placed at the beginning presumably to destroy the « pretensions of science » and clear

the field for real humanism, one quotation from it will suffice to illustrate his muddleheadedness (p. 11): « In principle, alchemy is but little different from modern chemistry. Our most recent theory still holds that the difference between lead and gold is due only to the numerical relations of a single element, the electron. The difference between chemistry and alchemy does not lie in either their fundamental hypotheses or their methods, but in our vastly superior technique of experimentation and accumulated knowledge. The nature of the modern electronic atom is essentially as fictitious as was the nature of the mediaeval elements. » I shall not stop to discuss those statements which contain just enough truth to give them a color of plausibility.

This age of ours, which is so often called—wrongly—the « scientific age » is far from perfect, but the main source of its imperfection is the fact that the elite is divided into two hostile groups, the « humanistic » and the scientific. Our crying need is the bridging of the widening gap which separates them. Our scientists ought to be humanized, and the « humanists » ought to learn what science really means. All of my life and energy are devoted to bringing about that reconciliation, that new synthesis. On the contrary, the humanists or Babbittists would say to the men of science « Do not go beyond your technicalities,—remain in your own « natural world »—they would deliberately increase the gap which imperils our civilization more than anything else. Their attempt would be frightening indeed if we did not realize how futile it is. Whether they like it or not, the day is approaching when scientists will have a decisive share in education, and when they will emulate historians in their efforts to bridge the gap and thus secure a deeper collaboration between the leaders. « The humanism of our time will make as large a place for science as for art and literature and religion, or, it will perish. »

GEORGE SARTON.

Q. Vetter. — *Jak se počítalo a měřilo na úsvitě kultury*. By Q. VETTER. « Melantrich » v Praze. Lidová Universita. Svazek XV, 141 p., (Wie gerechnet und gemessen wurde zur Zeit des kulturellen Erwachens. Von Professor QUIDO VETTER, Prague, 1926).

In einem konzis und klar geschriebenen Buche führt uns der Verfasser in das kulturelle Milieu der vormathematischen Zeit der Mittelmeervölker. Er weist in geradezu spannender Form die von der völkerpsychologisch vergleichenden Wissenschaft blosgelegten Spuren auf, wie der Zahlenbegriff sich langsam geklärt und nach gewonnener Abstraktion der Zahlenkalkül sich entwickelte.

Das aus Vorlesungen in den Jahren 1920-22 hervorgegangene Buch handelt im 1. Kapitel über die Anfänge des Rechnens und zwar die

Entstehung des Zahlbegriffs bei den primitiven Völkern; die Quelle, aus der wir über diese prähistorischen Zeiten schöpfen, ist die Sprache und unsere Kenntnis über primitive Völker unserer Zeit. Entstehung des Zehner- und sexagesimalen Zahlensystems bei verschiedenen Völkern, und deren Erklärung; schriftliches Festlegen der Zahlen durch Einkerben, Symbole, und endlich durch Ziffern.

Das 2. und 3. Kapitel behandelt Rechnen und Messen in Mesopotamien, bezw. Ägypten. Interessant sind vor allem die Mitteilungen über die eigenartigen Rechenmethoden beim Gebrauch des Sexagesimalsystems und dessen Zusammenhang mit der Astronomie, über geometrische Kenntnisse beim Vermessen von Feldern, beim Bau der Pyramiden, die Mitteilungen über die vier Rechnungsarten wie sie vor 4000 Jahren durchgeführt wurden, und insbesondere über das älteste uns erhaltene Rechenbuch den « Papyrus Rhind » der Ägypter.

Quellenangabe und vor allem auch deren wohlerwogene Kritik zeugen von sorgfältiger Orientierung und erhöhen den Wert des Buches in den Augen des Lernenden wie des zünftigen Wissenschaftlers.

VETTER's Buch entwirft so vor unseren Augen ein Stück der Geschichte menschlichen Denkens vor 4000 Jahren an den für uns durch Religion und Wissenschaft geheiligten Stätten Mesopotamiens und Ägyptens und gibt uns die Möglichkeit, die Genialität der Griechen, der jungen geistigen Erben und Mehrer dieser alten Kulturen zu begreifen, deren logisch wohlfundierte Konzeptionen von Zahl und Mass anzuzweifeln und zu revidieren erst dem 20. Jahrhundert vorbehalten scheint.

RUTH STRUIK.

Paul Victor Neugebauer.—*Astronomische Chronologie.* Vol. 1, text, XII+190 p., 17 figs. Vol. 2, tables, 136 p. Berlin, WALTER DE GRUYTER and Co., 1929. (RM. 37).

In 1895, WALTER F. WISLICENUS published his *Astronomische Chronologie.* It was the first attempt to give the historians and archaeologists all the information necessary for the solution of the usual problems of astronomical chronology. The book consisted of two parts : Astronomische Grundbegriffe (44 p.) and Die Berechnungsmethoden (111 p.) ; it explained, in plain language, how to use the best of the then available tables ; among its characteristic features we shall mention the absence of tables, and the systematic references, in the practical part, to the corresponding sections of the theoretical part. In the natural course of events, the second part of the book by WISLICENUS became hopelessly obsolete.

In 1912, PAUL V. NEUGEBAUER began the publication of his excellent *Tafeln zur astronomischen Chronologie ;* they consist of three parts and

an appendix : 1. Sterntafeln von—4000 bis zur Gegenwart (II+85 p., 1912) ; II. Tafeln für Sonne, Planeten und Mond (XXX+118 p., 1914) ; III. Hilfstafeln zur Berechnung von Himmelserscheinungen (LIV+74 p., 1922) ; the « Anhang » extending the tables north of latitude 60° appeared in 1925. Elementary explanations, with numerical examples, precede the tables ; information concerning contents and precision of the tables is given separately and labelled « Nur für Astronomen bestimmt », so as not to deter the historians and philologists mentioned on the title-pages.

The first volume of P. V. NEUGEBAUER's *Astronomische Chronologie* supersedes the introductory chapters to the *Tafeln z. astr. Chron.;* the second volume of the book under review completes the tabular material of the *Tafeln z. astr. Chron.* In the preface to his new work, P. V. NEUGEBAUER states that it is intended as a manual for historians and orientalists ; it ought to enable them to solve—without the assistance of an astronomer—the usual problems of astronomical chronology. The manual appears at a very opportune moment. On the one hand, astronomy is becoming astrophysics, and the number of workers in the field of astronomical chronology shrinks ; on the other hand, the assiduous digging of archaeologists gives promise of such harvests in this same field that the traditional prejudice of philologists and historians against the use of mathematical formulae and tables will have to be given up. It seems to the reviewer that the second part of the first volume of the *Astronomische Chronologie* is so skilfully written that even an archaeologist who never cared for astronomy might be tempted to personally investigate what can be done with those data he intended to submit to his mathematically minded friends.

It is a fortunate circumstance that the second, practical part (p. 32-185) of the first volume of the book under review is quite independent from the first, theoretical part (p. 1-31). The author tells us in the preface that a more detailed treatment of the « astronomische Grundbegriffe » would have transformed the theoretical part of his first volume into a short textbook of spherical astronomy, and refers the reader to the elaborate treatment of these elementary matters in the first volume of F. K. GINZEL's *Handbuch der Chronologie* (1906-14). If the self-sufficient character of P. V. NEUGEBAUER's manual for non-astronomers has to be given up, it is simpler to omit the inadequate theoretical part : the user of the conveniently arranged practical part of the first volume can be referred to any elementary textbook, if he desires to have a deeper insight into the problems he is enabled to solve. It is not improbable that some of the prospective users of the manual will give up in despair, after a struggle with the too condensed first part ; this danger could be reduced if the well selected but inadequately treated theoretical

matter were relegated to an appendix preceding the index where it would be less conspicuous and where it could be considered as a connected set of short definitions. Since astronomers do not need the theoretical introduction, they would not mind its transformation into a short textbook of about fifty pages and the resulting increase in the value of the manual to its non-astronomical users. The example (p. 28-31) which illustrates the dating of an incunabulum by astronomical evidence is an unwelcome intruder into the theoretical part, where space is so precious.

The second, practical part (p. 32-185) is an excellent « Leitfaden » for leading the uninitiated through the highly technical tabular literature to the goal—the solution, without the aid of an astronomer, of the usual problems of astronomical chronology. It consists of twenty-one chapters (designated as « paragraphs »), and covers the whole range of chronological problems capable of an astronomical solution.

In chapters 1, 2 and parts of chapters 3 and 13, the reader will find a valuable survey of the tabular literature ; the more important works are discussed at length, critically and exegetically.

Chapters 4 to 12 (p. 48-94) deal with the determination of positions of the heavenly bodies, the computation of ephemerides, the parallax and the phases of the Moon, the conjunctions and occultations. The generic titles of the chapters and the specific titles within the chapters will permit even the casual user of the manual to find the solution of his problem. The introduction preceding the solution of a specific problem indicates the tables to be used, outlines the method, points out the precision of the results thus obtained, etc. The detailed instructions for the solution of the problem are given, step by step ,in numbered subdivisions of the left column, the corresponding subdivisions of the right column showing the gradual progress of the numerical computation. Comparison with result obtained by other methods, or other relevant remarks follow some of these Musterbeispiele.

Chapters 13 and 14 (p. 95-133) deal with solar and lunar eclipses in a very thorough and clear way. A detailed treatment of the AGATHOCLES eclipse (-309 Aug. 15) is given on the right pages 113 to 121, showing an ideal arrangement of the twenty-nine steps of the computation corresponding to the twenty-nine clearly worded instructions printed on the opposite left pages 112 to 120. The visibility, in Babylon, of the THALES eclipse (-584 May 28) similarly illustrates a special case. For these two numerical examples, as well as for the detailed computation, for Babylon, of the lunar eclipse of -720 March 19, the tables of the second volume were used. A reference table, on p. 96, indicates, however, the advisability of using the *Kanone der Finsternisse* by TH. V. OPPOLZER (1887), by F. K. GINZEL (1899), and by J. F. W. SCHROETER (1923),

(see *Isis*, 6, 208), according to the time, place, and nature of the eclipse ; it is obvious that in many cases a simple inspection of the eclipse-maps of the *Kanone* will solve the problem of the historian.

Chapters 15 to 20 (p. 133-175) deal with the signs of the zodiac ; the equinoxes and solstices ; the daily motion of the celestial bodies ; the question of the orientation of monuments ; the yearly rising and setting of the stars, especially the heliacal rising of Sirius in Egypt and Babylonia ; the yearly rising and setting of the planets, and the conditions of their visibility ; the transformation of equatorial coördinates into ecliptical and vice-versa. In addition to the numerical solution of numerous problems, there are critical considerations concerning such controversial questions as the arcus visionis or the orientation of monuments. The rotating star-map (p. 146-149) is useful for the approximate solution of many a problem, but the necessity of preparing a set of maps (fig. 14) for the different epochs, and a set of « horizons » (fig. 15) for the different latitudes limits the convenience of the method ; the « precessionarium » (a small celestial globe adjustable for precession and for latitude, see *Isis*, 14, 308) seems to be a simpler—and the Zeiss planetarium a more efficient—device for similar purposes.

Chapter 21 (p. 175-185) gives a list of comets (612 B.C.—A.D. 1582) based on PH. CARL's *Repertorium der Kometen-Astronomie* (1864), i.e., indirectly, on A. G. PINGRÉ's *Cométographie* (1783-84) and on EDOUARD BIOT's catalogue of Chinese observations (*Connaissance des temps* pour l'an 1846). The table gives the year of the phenomenon listed as a comet, the month or the season, the constellation or the region of the sky, the country, and references to PINGRÉ or to BIOT. No example is given, but the problem of dating an incunabulum has the apparition, in January 1472, of a comet in Virgo as a terminus post quem among its data ; this problem, involving the checking of roughly computed—not observed—positions of the Sun and of the Moon, in addition to an observed planetary conjunction, should have been treated at the end of the practical—not of the theoretical —part of the first volume.

A very complete and conveniently arranged index occupies ten columns. The proofreading has been done with the utmost care. Typographically, the *Astronomische Chronologie* is a real achievement, especially if one takes into consideration the exceptionally low price of the book. Is the publisher inaugurating the return to reasonable prices for books printed in Germany ?

Part of the tables of the second volume are a monument to the genius of ROBERT GUSTAV SCHRAM and of CARL SCHOCH. The contributions of the latter to astronomical chronology are of such a nature that his name is mentioned throughout the first volume ; his methods are often severely

criticized but his results have to be taken into consideration and are extensively used, generally in a modified form. When PAUL V. NEUGEBAUER does not incorporate the results of SCHOCH's investigations in his second volume, he gives at least, in the first volume, as a key to the writings of SCHOCH, detailed instructions for their use. Thus, pages 167 to 173 will help the orientalist to find his way through SCHOCH's *Astronomical and calendariographical tables* attached to *The Venus tablets of Ammizaduga* (1928), by S. LANGDON and J. K. FOTHERINGHAM. (The work of LANGDON and FOTHERINGHAM is the subject of a paper by OTTO NEUGEBAUER, in *Orientalistische Literaturzeitung*, 32, 913-921, 1929; see *Isis*, 14, 510). PAUL V. NEUGEBAUER mentions (p. 190 and p. 97) SCHOCH's intention of extending these tables from -3000 to our times, and of computing a special *Kanon der Finsternisse* for -3000 to -1200. CARL SCHOCH died in 1929.

Back to the *Astronomische Chronologie*. Together with P. V. NEUGEBAUER's *Tafeln zur astronomischen Chronologie* it constitutes a set of books which deserves the attention of every orientalist, classical philologist, mediaevalist, etc. Generally, he will find in it a direct answer to his problems in astronomical chronology; in special cases he will be referred —fully equipped with detailed instructions—to the works of TH. V. OPPOLZER, R. G. SCHRAM, F. K. GINZEL, J. F. W. SCHROETER, and C. SCHOCH. A. POGO.

F. S. Bodenheimer.—*Materialien zur Geschichte der Entomologie*. bis LINNÉ. Band II. VI+486 p., 100 Abb. Berlin, JUNK, 1929 (2 vols., Rm. 132 bound, Rm. 120 unbound).

A long review of the first vol. appeared in *Isis* (13, 387-391, 1930), and other reviews of it may be found in *Nature* (vol. 123, 935-37), in the *Deutsche entomologische Z.* (1929, 76-77), and in the *Entomologische Blätter* (1929, 63-64). It is thus less necessary to insist upon the second volume, for every entomologist is or should already be acquainted with BODENHEIMER's great undertaking. It will suffice to prove that the second volume keeps the promise made by the first.

Let us analyze it. It deals mainly with the period 1660-1750, but includes various digressions referring to earlier times. I indicate the main contents using the author's own notations.

(d) *Applied entomology*.—Agricultural entomology. Locust years (p. 26-48)—a very interesting account with various chronological tables, allowing one to appreciate the synchronisms of locust invasions into various countries. Apiculture and knowledge of bees. Sericiculture. Vermin: fleatraps of FRANZ ERNST BRÜCKMANN (1696-1753). JOHN SOUTHALL's Treatise on bugs (2nd ed., London, 1730).

(e) *Learned societies and academies.*—Brief accounts of the origins of the Italian academies, the Royal Society, the Academia naturae curiosorum, the Académie des Sciences, the Prussian and Swedish academies, etc. with special emphasis on their entomological activities. For example, apropos of the Royal Society, the author speaks of EDMUND KING (1667), FRANCIS WILLOUGHBY (1670), MARTIN LISTER, JOHN RAY, JOHN TEMPLER, LEEUWENHOEK (1673, etc.), RICHARD WALLER, WILLIAM MOLYNEUX, E. FLOYD (1694), BENJAMIN ALLEN, DIACINTO CESTONE, JACOB HARTMANN, J. WILSON, etc. These extracts from the *Philosophical Transactions* cover 18 pages ; those from the publications of Academia naturae curiosorum, 14 pages ; all the others, 22 pages.

(f) *Increase of knowledge due to explorations.*—1. Latin America, 2. North America, 3. Levant and N. Africa, 4. Aethiopian Africa, 5. Asia, 6. Early data on the dissemination of cockroaches. Section 3 deals with PIERRE BELON, LEO AFRICANUS, PROSPER ALPINUS, JOSEPH PITTON DE TOURNEFORT, THOMAS SHAW, FRIEDRICH HASSELQUIST (p. 171-75), ALEX. RUSSELL (1756). Section 6, on the artificial dissemination of *Blatta orientalis* by human intercourse, contains extracts from the writings of PETER OSBECK (1750-52), OLAF TOREEN (1750-52). The oldest reference to *Periplaneta americana* was made by THOMAS BARTHOLIN in the *Acta medica et philosophica hafniensia* (vol. 1, 1671).

(g) *History of the knowledge of cochineals.*—Of course, this chapter takes us back to much earlier times, to the coccos phoenicos of THEOPHRASTOS and the coccos baphicos of DIOSCORIDES. The author deals successively with the kermes species used by the ancients for dyeing ; the true cochineals *(Coccus cacti)* used by the Aztecs ; the Polish cochineals *(Margarodes polinicus)* ; the lacquer insects *(Carteria lacca)* ; *Ceroplastes rusci* ; *Ericerus pe-la* (known to the Chinese) ; etc. A table shows the increase of knowledge of cochineals by comparison of various editions of the *Systema naturae* (ed. 1, ed. 2, ed. 6, ed. 10, ed. 12, to-day).

(h) *Various efforts and publications of the seventeenth and eighteenth centuries.*—Various phaenomena : insects falling with snow, rains of insects ; plague of insects at the Prussian-Polish frontier in 1679 *(Tremax fuscicornis, « Musca polonica »)* ; « blood » rains ; snow fleas *(Podura nivalis)*, earliest reference to them in 1633 by DAVID SPIELENBERGER of Warsaw. Physico-theologians. CHARLES BONNET's *scala naturae* and the similar views expressed in the Philosophical account of the works of Nature by RICHARD BRADLEY (1721). FRANZ ERNST BRÜCKMANN. SAMUEL DALE. Popular entomological literature in the eighteenth century.

(i) *History of entomological collections.*—Collections of insects ; methods of capture and preparation ; entomological iconography.

A final part is devoted to the beginning of the systematical epoch, i.e., to LINNAEUS (p. 275-99). Additional notes to both volumes fill some ten pages.

A series of 43 tables (p. 312-456) constitute a very accurate survey of pre-Linnaean entomology at different times. This is one of the most precious parts of BODENHEIMER's work. To give a complete list of all of these tables would take too much space ; let me quote a few of them, e.g. : 1. Insects (64 in number) in the Êrh Ya (see my *Introduction*, vol. 1, 110) ; 2. Insects (45) in the Pên ts'ao kang mu ; 3. In the Bible ; 4. In the Babylonian Talmud ; 5. ARISTOTLE and PLINY ; 7. AL-DAMÎRÎ ; 8. AL-QAZWÎNÎ ; 9. ISIDORUS, Liber de natura rerum, ALBERT THE GREAT, Buch der Natur, PETRUS CANDIDUS ; 10. Hortus sanitatis, MATTIOLLI, LONICERUS, PAULUS AEGINETUS, Altdeutsches Kräuterbuch, BERCHOVIUS, W. FRANZ, BOCHARTIUS ; 13. U. ALDROVANDI ; 14. THOMAS MOUFFET ; 19. M. MALPIGHI, including references in the Ms. diaries of Bologna, etc., etc.

The reader who has been patient enough to follow me thus far will realize the enormous wealth of material accumulated by the author and so generously distributed by him. He deserves our gratitude, and his publishers would have shared it with him if the selling price of these volumes had been more reasonable. As it is, they are unfortunately beyond the reach of the majority of scholars and even of a great many libraries.

GEORGE SARTON.

John C. Merriam.—*The living past.* XI+144 p., 16 pl. New York, CHARLES SCRIBNER'S Sons, 1930 ($ 2).

This collection of seven geological and palaeontological essays does not belie its title, for it brings the distant past within the field of our imagination, or to put it otherwise, it gives us the illusion that we have been carried into it as if by a kind of magic carpet. They prove that the author is not simply a great palaeontologist but a man of imagination, and to that extent, a poet and an artist. The first chapter entitled « The meaning of a fragment » reads like a detective story. Would that the amateurs of such stories, and their name I understand is Legion, could be persuaded to tackle this one ! If they did so they would certainly read the whole book in a single evening.

I shall not attempt to summarize these stories because I do not want to spoil the reader's pleasure, but the author's trend may be illustrated by a few quotations.

Apropos of the Columbia Gorge, where he found fossil Gingko leaves, he remarks (p. 52) : « To know the whole story takes nothing from appreciation of form and feature as they appear at the moment. This

knowledge only extends our vision. We come to realization that the elements of grandeur comprised in bulk and static strength have their present values because they are residual demonstrations of power exerted in a great work of construction. To-day we begin to see through all nature the movement of great forces involved in the process of creation. As this panorama opens we glory in our growing power of comprehension. Then on a rare occasion, in an unexpected region, there appears a new expression of reality far transcending that built upon previous experience and imagination. This flash of understanding, with widening horizon, can come to each individual as veritable revelation. It may bring realization of unmeasured power bound in the atom, another universe beyond the stars, a new vista in the past, or an explanation of some baffling phase in human life. »

And a little further the redwood groves of northern California suggests the following thought (p. 58) :

« The mysterious influence of these groves arises not alone from magnitude, or from beauty of light filling deep spaces. It is as if in these trees the flow of years were held in eddies, and one could see together past and present. The element of time pervades the forest with an influence more subtle than light, but that to the mind is not less real. »

And again in the Grand Canyon (p. 92) :

« As this abyss of time cuts down across the ages, it presents in clear perspective of one great picture the reality, the sequence, and the movement in a vast tide of events. The beginnings do not appear, but upon the high walls enough is written to illustrate the processes of change, and to show us also that the end is not in view. »

Near Carson City, Nevada, there is a prison yard containing extraordinary footprints of extinct animals.

« I often wonder whether at Carson Prison Yard the men who have constantly before them this almost miraculous preservation of evidence of what happened in a remote age, consider it a suggestion that no time is too long after an event for the uncovering of what has happened. Or does it indicate to them that not years, nor the elements, nor anything, may take away the influence of a mark once made? Or is the story to them as I would see it—that is, the evidence that in this changing world in which we live there is always hope that something better may be built? » (p. 109).

When the author had to select a title for this charming little book, he chose naturally one which had been in his mind for a great many years. « The living past ». His own knowledge and imagination had caused him to live in that past, and finally to resurrect it. A thing is not dead as long as it can be remembered. The past is still living. He

did not know then that the same title had been chosen a few years previously by FRANCIS SYDNEY MARVIN (1913, see *Isis*, 2, 425). However these two excellent books have little in common beyond their title, and even this is the same only in appearance, for MARVIN's past is extremely different from MERRIAM's. MARVIN had given us a very vivid outline of Western civilization. The past, to be sure, but such past from the geological point of view is almost the present, for what are a few thousand years as compared with the millions of centuries of the earth's evolution?

Historians and geologists have altogether different standards of time. The geological record is largely pre-historical. In the same way, one might conceive an astronomical record which would be largely pre-geological. One might even conjure up a time of chaos largely pre-astronomical. But we need not go so far back. There is enough in the geological account to humble our minds and fill our hearts with wonder and a sort of sacred joy. GEORGE SARTON.

Twenty-eighth Critical Bibliography

of the

History and Philosophy of Science and of the History of Civilization.

(to January 1930)

This Twenty-eighth Bibliography contains about 750 items, some of which have been kindly contributed by the following scholars :

E. W. Adams (Hertford)
H. G. Bévenot (Weingarten, Würtemberg)
M. Bloch (Leningrad)
L. Guinet (Brussels)
E. Honigmann (Breslau)
A. Pogo (Cambridge, Mass.)
V. V. Ramana-Sastrin (Vedaraniam, S. India)
L. Thorndike (New York)
H. R. Viets (Boston).

This bibliography includes the tenth series of addenda and errata to Volume I of my *Introduction to the History of Science* (Baltimore and London, 1927). An author's index will be found at the end.

Papers and books sent to the Editor are entered into this bibliography if they are relevant to its purpose. They may be the object of analytical notes or longer reviews, if this seems sufficiently necessary and the services of competent scholars are available. It is obvious that only a small number of publications can be adequately reviewed and that it is not even possible to give a brief description of each and every one. However, our classification is so comprehensive and so minute, that even if we do nothing but give the accurate title of an item and put it in the proper place, we are already rendering a real service to the author, the publisher and the learned public. There is no relation between the importance of a publication and the length of the note devoted to it.

The ultimate aims of this undertaking are : (1) to establish the History of Science as an independent discipline ; (2) to demonstrate inductively the Unity of Knowledge and the Unity of Mankind ; (3) to serve as a center of information and rallying ground to the scholars engaged in our studies.

Harvard Library, Room 185.
Cambridge, Massachusetts.

George Sarton.
February 12, 1930.

PART I

Fundamental Classification (centurial)

IXth Century B. C.

Körner, Otto. Die Bienenkunde bei HOMER und HESIOD. Dichtung oder Forschung? *Sitzungsber. u. Abh. d. Naturf. Ges. zu Rostock.* 2, 13 S., 1927/28 (1929). ISIS

VIth Century B. C.

Brewster, Earl H. GOTAMA LE BOUDDHA. Sa vie. D'après les écritures palies, choisies par E. H. BREWSTER, avec une préface de C. A. F. RYS DAVIDS. Trad. française de G. LEPAGE, 256 p., Paris, PAYOT, 1929 ISIS

Edition originale, Londres, 1926 (*Isis*, 10, 105). « Les écritures palies contiennent le récit le plus authentique de la vie du BOUDDHA et de nombreux points en ont été vérifiés par l'histoire. Le canon tel que nous le possédons a été composé — mais non pas rédigé — au Concile de Patna, vers 250 avant J. C., de récits faits de mémoire. De dates diverses, ces récits comprennent tout ce que la tradition orale avait transmis depuis le VI^e^ siècle avant J. C., époque du fondateur, jusqu'aux sujets développés, plus récents, composés, peut-être, peu avant ce concile ». — Il est regrettable que des notes critiques ne donnent pas indication des problèmes soulevés par la vie et l'enseignement du BOUDDHA. L. G.

Fotheringham, J. K. CLEOSTRATUS III. *Journal of the Hellenic Studies*, 45, 78-83, 1925. ISIS

Continuation of the controversy mentioned in my *Introduction* (I, 73). Says the author: « The question of widest interest on which we differ is that of the source from which CLEOSTRATUS derived the zodiacal signs and the octaeteris. In my opinion Babylon was the source in both cases. Mr. WEBB differs from me on both points. » G. S.

Hecataeos (*Intr.* 1, 78). Important article by FELIX JACOBY in *Pauly-Wissowa*. E. H. ISIS

Heidel, William Arthur. ANAXIMANDER's book, the earliest known geographical treatise. *Proceedings of the American Academy of arts and sciences*, 56, 237-88, 1921. ISIS

Wellmann, Max. ALKMAION VON KROTON. *Archeion*, 2, 156-69, 1929. ISIS

Exposé très documenté de la pensée d'ALCMÉON DE CROTONE.

Vth Century B. C.

Democritos (*Introduction*, vol. 1, 89). EUGEN ODER: Ein angebliches Bruchstück DEMOKRITS über die Entdeckung unterirdischer Quellen 1. *Quellensucher im Altertum* (*Philologus*, Suppt. Bd. 7, 229-384, 1899). E. H. ISIS

Hanno (*Introduction*, 1, 103). Best edition by WOLF ALY in *Hermes* (vol. 62, 321-24, 1927). E. H. ISIS

Hippocrates of Cos (*Introduction*, 1, 98). Apropos of Airs, waters, and places, add KARL TRÜDINGER: Studien zur Geschichte d. griech.-röm. Ethnographie (*Diss.*, Basel, 1918, 170-73). Against FELIX JACOBY. E. H. ISIS

Hippodamos of Miletos (*Intr.*, 1, 95). Cultrera: Architettura ippodamea (*Memorie della R. Accademia dei Lincei*, vol. 17, 361-603, 1923). Über HIPPODAMOS, S. 361-77. ARMIN VON GERKAN: Griechische Städteanlagen (Berlin, 1924, 42-61). E. H. ISIS

Mieli, Aldo. L'epoca dei sofisti e la personalità di SOCRATE (nota preliminare). *Archeion*, 2, 178-89, 1929. ISIS

L'auteur essaie de montrer que la conception traditionnelle que se font les philosophes, de SOCRATE et des sophistes, est fausse. Le vrai portrait de SOCRATE ne serait pas celui de PLATON, mais celui qu'en a fait ARISTOPHANE dans les Nuées. L. G.

Scylax (*Intr.* 1, 104). See GISINGER's study in *Pauly-Wissowa*. ISIS

IVth Century B. C. (whole and first half)

Burnet, John. Platonism. 130 p. Berkeley, University of California Press, 1928. ISIS

Reviewed by MAURICE CROISET, *Journal des savants*, 322-23, 1929.

Demel, Seth. PLATONS Verhältnis zur Mathematik. (*Forschungen zur Geschichte der Philosophie und der Pädagogik*, Band 4, Heft 1: Der ganzen Reihe Heft 10.) v+146 p. Leipzig, MEINER, 1929. ISIS

Plato. Atlantis (*Intr.*, 1, 115). PAUL FRIEDLÄNDER: PLATON als Geograph (PLATO, vol. 1, 242-75, Berlin, 1928). E. H. ISIS

IVth Century B. C. (second half).

Aristotle. Apocrypha (*Intr.* 1, 135). Apropos of the περὶ τῆς τοῦ

Νείλου ἀναβάσεως, see W. CAPELLE (*Jahrb. f. klass. Phil.*, 33, 317 ff., 1914), F. JACOBY in PAULY-WISSOWA, under KALLISTHENES; PETER CORSSEN (*Philol.*, 74, 16 ff., 1917). E. H. ISIS

Ephoros of Cyme (*Intr.* 1, 147). Best edition by FELIX JACOBY: Fragmente der griechischen Historiker (Berlin, 1923-29). E. H. ISIS

Tarn, W. W. ALEXANDER and the Ganges. *Journal of the Hellenic Studies*, 43, 93-101, 1923. ISIS

IIIrd Century B. C. (whole and first half)

Dijksterhuis, E. J. De Elementen van EUCLIDES. Deel 1. De ontwikkeling der grieksche wiskunde voor EUCLIDES. Book I der Elementen. XVI+220 p., 44 fig. Groningen, NOORDHOFF, 1929. ISIS

Sostratos of Cnidos (*Intr.*, 1, 161). HERMANN THIERSCH: Pharos. Antike, Islam, und Occident. Ein Beitrag zur Architekturgeschichte (Leipzig, 1909). E. H. ISIS

IIIrd Century B. C. (second half)

Conon of Samos (*Intr.* 1, 173). l. 2,.. containing the *Chaldaean* observations? SENECA (Nat. Qu., VII, 3, 3): observatas ab *Aegyptiis*. E. H. ISIS

Eratosthenes (*Intr.*, 1, 173). R. VON SCALA: Das Fortleben der eratosthenischen Masse (*Verhdl. d. 18. Deutsch. Geographentages zu Innsbruck*; Berlin, 1912, 206-17); J. MEUNIER: Les sources de la monographie d'ARRIEN sur l'Inde (*Musée belge*, 1922, 5-24; not seen). E. H. ISIS

IInd Century B. C. (whole and first half)

Agatharchides of Cnidos (*Intr.* 1, 185). EMIL AUG. WAGNER: A. und der mittlere Peripatos i (Progr., Realgymn., Annaberg, 1901); OTTO IMMISCH: AGATHARCHIDES (*Sitzungsber., Heidelberger Akad.*, 1919, Abhd. 7). E. H. ISIS

Arrian the Meteorologist (*Intr.*, 1, 184). ARRIANOS der Physiker kann schon wegen seines Namens nicht so früh angesetzt werden wie W. CAPELLE wollte (1905), vgl. dagegen v. WILAMOWITZ (*Hermes*, 41, 156 f., 1906) der das 2. Jahrhundert n. Chr. annahm, und danach

CAPELLE selbst (*Hermes*, 48, 1913, 350): in einem der drei ersten Jahrhunderte n. Chr. E. H. ISIS

Hörle, Josef. CATOS Hausbücher. Analyse seiner Schrift *De agricultura* nebst Wiederherstellung seines Kelterhauses und Gutshofes. VIII+ 270 p. (*Stud. z. Gesch. u. Kult. d. Altertums*. Hrsg. v. E. DRERUP, H. GRIMME u. J. P. KIRSCH. Bd. 15, H. 3 u. 4.). Paderborn, SCHÖNINGH, 1929. ISIS

Reviewed by W. KROLL, *Deutsche Literaturzeitung*, 6, 1816-18, 1929.

Seleucos the Babylonian (*Intr.*, 1, 183). On his native city, see F. CUMONT in *Syria* (vol. 8, 83 ff., 1927). E. H. ISIS

IInd Century B. C. (second half)

Callaneus (not mentioned in *Intr.*, vol. 1). Ein indischer Astronom KALLANEUS (KALANOS?) wird auf einem Kalender v. 110 v. Chr. genannt (H. DIELS, *Berl. Ak. Sitz. ber.* 1904, 108). CHRIST-SCHMID, *Griech. Lit. Gesch.* II, 1, 6 Aufl., S. 281, Anm. 5. E. H. ISIS

Ist Century B. C. (whole and first half)

Cicero (*Intr.*, 1, 207). GISINGER: CICERO als Geograph und ALEXANDER LYCHNOS (*Philolog. Wochenschrift*, 1929, 1167). E. H. ISIS

Glaucias (*Intr.*, 1, 215). Of Tarentum? vielmehr « Thettalos »? vgl. die Vermutung von CONRAD CICHORIUS, *Rhein. Museum*, 63, 1908, p. 223, n. 1 über ihn. E. H. ISIS

Posidonios (*Introduction*, 1, 204). POSEIDONIOS' Geschichtswerk reichte wohl bis 86/4 (Friede von Dardanos) und wurde wohl noch in den 80er Jahren verfasst. ISIS

W. CAPELLE: Die griechische Erdkunde und POSEIDONIOS (*Neue Jahrb. für klass. Philol.*, 45, 305 ff., 1920); K. REINHARDT. Kosmos und Sympathia, neue Untersuchungen über POSEIDONIOS (München, 1926); ISAAC HEINEMANN: POSEIDONIOS' metaphysische Schriften (2 Bde., Breslau 1921-28); ROBERT MUNZ: POSEIDONIOS und STRABON (Göttingen, 1929). E. H.

Roman astronomy (*Intr.*, 1, 213). L. TARUTIUS FIRMANUS (Schanz, RLG, I 2, 508 f.). E. H. ISIS

Serapion of Antioch (not mentioned in *Introduction*, vol. 1) Geographer and astrologer, contemporary of POSIDONIOS, possibly a pupil of HIPPARCH. Quoted by PLINY: SERAPIO gnomonicus, antiochenus.

He compiled astronomical handtables called *πρόχειροι κανόνες*, a title imitated by PTOLEMY and later by others. His work was probably the oldest specimen of astrological geography and ethnography, wherein the knowledge of peoples, cities, countries, planets, «climates», zodiacal signs was brought together in a single synthesis. He constructed a map of the world wherein the main cities (*πόλεις ἐπίσημοι*) were indicated. His writings were read by P. NIGIDIUS FIGULUS, CICERO, MANILIUS, PLINY, and exerted some influence, directly or indirectly, upon all the later astrological authors. He is not mentioned in PTOLEMY's geography, though PTOLEMY has certainly used him. He was one of the channels through which HIPPARCH's work was transmitted, another contemporary channel being POSIDONIOS; it is probable that some of the knowledge the transmission of which had been ascribed to the latter, was actually transmitted by the former. ERNST HONIGMANN: Die sieben Klimata (Heidelberg, 1929, 45-50, 67-70; *Isis*, 14, 270-76).

G. S. ISIS

Ist Century B. C. (second half)

Menippos of Pergamon (not included in *Intr.*, vol. 1). Contemporary of ISIDORE of CHARAX (vol. 1, 230). Author of a Periplus, see HUGO BERGER: Geschichte der wissenschaftlichen Erdkunde der Griechen (1903, 533). E. H. ISIS

Varro (*Intr.*, 1, 225). RICH. REITZENSTEIN: Die geograph. Bücher VARROS (*Hermes*, 20, 514-51, 1885). E. H. ISIS

Ist Century (whole and first half)

Ovid. PUBLII OVIDII NASONIS Fastorum libri sex. The Fasti of OVID. Edited, with a translation and commentary, by Sir JAMES GEORGE FRAZER. In five volumes. Vol. I., Text and translation, XXXI+357 p. Vol. II., Commentary on books I and II., 512 p. Vol. III., Commentary on books III and IV., 424 p. Vol. IV., Commentary on books V and VI., 353 p. Vol. V., Indices, illustrations, plans, XIII+212 p., pl. London, MACMILLAN, 1929. ISIS

Philon the Jew (*Intr.*, 1, 236). EMIL SCHÜRER: Geschichte des jüdischen Volkes im Zeitalter JESU CHRISTI (I^3 1901, II^4 1907, III^4 1909, Register^4 1911). E. H. ISIS

1st Century (second half)

✓ **Bailey, Kenneth C.** The ELDER PLINY's chapters on chemical subjects. Edited, with translation and notes. Part 1. 249 p. London, ARNOLD, 1929. ISIS

Dalman, Gustaf. JESUS-JESHUA. Studies in the Gospels. Authorized translation by PAUL P. LEVERTOFF. XIV+256 p. London, S. P. C. K., 1929. ISIS

Dionysios Periegetes (*Intr.*, 1, 258). Ought to have been placed in the following chapter. He flourished under HADRIAN (emp. 117-38), and hailed from Alexandria, as shown by two Akrosticha. G. LEUE (*Philol.*, 42, 1884, 175). E. H. ISIS

Hurst, George Leopold. The literary background of the New Testament. 163 p. New York, MACMILLAN, 1928. ISIS

Reviewed by J. SCHNIEWIND, *Deutsche Literaturzeitung*, 6, 2043-45, 1929.

Kershaw, Francis Stewart (-1930). A Han foot rule. *Bulletin of the Museum of Fine Arts*, Boston, vol. 28, 7-8, 1 fig., 1930. ISIS

Lead foot rule with gold inlay including an inscription dated 6th year of CHIEN CH'U (A.D. 81). Was this a standard foot? Its length is 23.45 cm. G. S.

✓ **Nero.** (*Introduction*, 1, 247). With regard to NERO's smaragdus, the correct reference is to PLINY, book 37, ch. 5. There is not sufficient evidence that that smaragdus was used as a lens.
E. W. ADAMS. ISIS

Periplus of the Erythrean Sea (*Intr.* 1, 257). HJALMAR FRISK: Le périple de la mer Erythrée (Göteborg, 1927, 1-22, Text). E. H. ISIS

Schonfield, Hugh J. An old Hebrew text of ST. MATTHEW's Gospel. Translated with an introduction, notes and appendices. 195 p. Edinburgh, CLARK, 1927. ISIS

Reviewed by P. L. COUCHOUD, *Revue de l'histoire des religions*, 97, 297-300, 1929.

Uxkull-Gyllenband, Woldemar Graf. PLUTARCH und die griechische Biographie. Studien zu Plutarchischen Lebensbeschreibungen des V. Jahrhunderts. 119 p. Stuttgart, KOHLHAMMER, 1927. ISIS

Reviewed by VICTOR EHRENBERG, *Deutsche Literaturzeitung*, 6, 1920-23, 1929.

IInd Century (whole and first half)

Arrian (*Intr.* vol. 1, 284). Indica edited by Roos: Scripta minora (vol. 2, 1928, 1-73), davon nur p. 35-71 NEARCHOS' Reisebericht; ARRIEN. L'Inde. Texte établi et traduit par PIERRE CHANTRAINE (Paris, 1927). Periplus Ponti Euxini, II, 103-28, ROOS. E. H. ISIS

Fotheringham, J. K. The secular acceleration of the Moon's mean motion as determined from occultations and conjunctions in the « Almagest » (a correction). *Monthly Notices of the Royal Astron. Soc.*, 83, 370-73, 1922/23. ISIS

Apropos of the investigation published in the *Monthly Notices*, 75, 377-94, 1915. See *Isis*, 4, 132, 1921.

Kaviratna, Avinash Chandra. English translation of Charaka-Samhita. 2074 p. Calcutta, 200 Cornwallis St., 1891-1925. ISIS

Reviewed by REINHOLD F. G. MÜLLER, *Mitteilungen zur Geschichte der Medizin und der Naturwissenschaften*, 29, 31, 1930.

(Manethon II). Astrologer who flourished about 110 A.D. He ought to have been at least mentioned. V. V. RAMANA-SASTRIN. ISIS

Marinos of Tyre (*Intr.*, vol. 1, 279). MAS'ÛDÎ kannte MARINOS gewiss nur aus arabischen Ptol. Bearbeitungen, deren Karten er wegen des rechtwinkligen Gradnetzes für die des MARINOS hielt, vgl. meinen Artikel MARINOS bei *Pauly-Wissowa*. E. H. ISIS

Ptolemy's Geography (*Intr.*, vol. 1, 275). The edition by NOBBE (not Noble) is the least complete. LOUIS RENOU: La géographie de PTOLÉMÉE. L'Inde (VII, 1-4). Paris, 1925. E. HONIGMANN: Zur Geographie des PTOLEMAIOS (*Klio*, 20, 202-14, 1925, im Anschluss an O. CUNTZ). KARL KRAUS: Über die Geographie des PTOLEMAEUS in HANS V. MZIK: Beiträge zur historischen Geographie (Leipzig, 1929, 144-56). E. H. ISIS

Robbins, Frank Egleston. A new astrological treatise: Michigan Papyrus no. 1. *Classical Philology*, 22, 1-45, 1927. ISIS

Valens, Vettius. You have not mentioned the name of VETTIUS VALENS of Antioch, the astrological author, and the senior contemporary of PTOLEMY. VETTIUS VALENS has been edited by WILLIAM KROLL

(1908). His book is invaluable as a repertory of many incidental items of old-world gossip, which we do not get in any other author.
V. V. RAMANA-SASTRIN. ISIS

IInd Century (second half)

Englert, Ludwig. Untersuchungen zu GALENS Schrift Thrasybulos. 103 p. (*Studien zur Geschichte der Medizin*, herausgeg. von KARL SUDHOFF und HENRY E. SIGERIST. H. 18). Leipzig, BARTH, 1929. ISIS

Reviewed by KARL DEICHGRÄBER, *Deutsche Literaturzeitung*, 6, 1765-68, 1929.

Huet, G. Notes d'histoire littéraire. II. Le roman d'APULÉE était-il connu au moyen âge? *Le moyen âge*, 29, 44-52, 1917. ISIS

IIIrd Century (whole and first half)

Roman itineraries (*Intr.*, vol. I, 325). Itineraria Romana, vol. I. It. Anton. Aug. et Burdigalense, ed. OTTO CUNTZ (Leipzig, 1929).
E. H. ISIS

IIIrd Century (second half)

Labriolle, Pierre de. PORPHYRE et le christianisme. *Revue d'histoire de la philosophie*, 3, 385-440, 1929. ISIS

L'auteur étudie le rôle du polémiste antichrétien en suivant le répertoire que HARNACK a dressé des fragments connus du κατὰ χριστιανῶν: PORPHYRIUS « Gegen die Christen »; 15 Bücher; Zeugnisse; Fragmente und Referate (*Abh. d. Kön. preuss. Ak. d. W.*; 1916).

A noter au sujet de PORPHYRE que la référence donnée par SARTON dans son *Introduction* (I, 335), de MARCUS GAZENSIS : Vita PORPHYRII episcopi gazensis, se rapporte, non pas au néo-platonicien PORPHYRE, mais à PORPHYRE, évêque de Gaza (ca. 350-421) (*Isis*, 10, 114). Cette vie de l'évêque PORPHYRE par le diacre MARC n'est d'ailleurs vraisemblablement pas authentique, ainsi qu'il résulte d'une communication non encore publiée, de H. GRÉGOIRE.
L. G.

IVth Century (whole and first half)

Stevenson, J. Studies in EUSEBIUS. VIII+146 p. Cambridge University Press, 1929. ISIS

This work deals with two distinct periods in the life of EUSEBIUS. After the introductory chapter, it deals with his life to the end of the Great Persecution (chapters 2 and 3) and then with his position in the Arian controversy (chapters 4-6).

IVth Century (second half)

Ephipanios (*Intr.* 1,362). *περὶ λίθων*. FERNAND DE MÉLY : Les lapidaires de l'antiquité et du moyen âge. Vols. 2 et 3. Les lapidaires grecs (1898-1902). E. H. ISIS

Itineraries (*Intr.*, vol. 1, 371). E. LÖFSTEDT : Philolog. Kommentar zur Peregrinatio Aetheriae (Uppsala, 1911). E. H. ISIS

Mackail, J. W. AMMIANUS MARCELLINUS. *Journal of Roman Studies*, 10, 103-18, 1920. ISIS

Monceaux, Paul. SAINT MARTIN. Récits de SULPICE SÉVÈRE mis en français avec une introduction. 292 p. Paris, PAYOT, 1926. ISIS

Reviewed by L. LEVILLAIN, *Le moyen âge*, 37, 200-03, 1927.

Stadiasmus mari magni (*Introduction*, vol. 1, 372). Nach AD. BAUER und O. CUNTZ hat der Stadiasmos schon in der im 3. Jahrhundert verfassten Chronik des HIPPOLYTOS (S. 320) gestanden, war mir allerdings nicht bewiesen scheint. E. H. ISIS

Vth Century (whole and first half)

Moses of Chorene (*Intr.*, vol. 1, 395). ARSÈNE SOUKRY : Géographie de MOÏSE DE CORÈNE d'après PTOLÉMÉE (Venice, 1881). E. H. ISIS

Orion (*Intr.* vol. 1, 398). FRIEDRICH RITSCHL : De Oro et ORIONE (Vratislaviae, 1834, Opuscula, 1, 582-673). RICHARD REITZENSTEIN : Geschichte der griechischen Etymologika (Leipzig, 1897, 311-20). E. H. ISIS

VIth Century (whole and first half)

Cosmas Indicopleustes (*Intr.*, vol. 1, 432). K. PATKANEAN : Armenian geography of the seventh century (in Russian, Petersburg, 1877, XI-XII, 10-11). FERNAND CABROL : Dictionnaire d'archéologie chrétienne (vol. 8, 820-49). E. H. ISIS

Mitteis, Ludovicus ; Levy, Ernestus ; Rabel, Ernestus. Index interpolationum quae in IUSTINIANI digestis inesse dicuntur. Editionem a LUDOVICO MITTEIS inchoatam ab aliis viris doctis perfectam

curaverunt ERNESTUS LEVY, ERNESTUS RABEL. T. 1. Suppl. 1. XXIII+402 col.; 186 col. Weimar, BÖHLAUS, 1929. ISIS

Reviewed by B. KÜBLER, *Deutsche Literaturzeitung*, 6, 2076-78, 1929.

Stephanos of Byzantium (*Intr.*, vol. 1, 433). Unsicher ist, ob die erhaltene Epitome die des HERMOLAOS ist. Vgl. meinen artikel Steph. Byz. in *Pauly-Wissowa*. E. H. ISIS

VIth Century (second half)

Evagrios Scholasticos (*Intr.*, 1, 455). Edition of the Ecclesiastical History by JOSEPH BIDEZ and LÉON PARMENTIER being vol. 1 of the Byzantine Texts edited by BURY (London, 1898). E. H. ISIS

Malalas (*Intr.*, vol. 1, 454). WILHELM WEBER: Studien zur Chronik des MALALAS (Festgabe für ADOLF DEISSMANN zum 60. Geburtstag, Tübingen, 1927, 20). E. H. ISIS

Paul the Persian (*Intr.*, vol. 1, 448). For Dêrshar, read Dîrîshar. Derr-i Shehr=Shehr-i Khusraw? HÜSING in *Der alte Orient*, vol. 9, 44. E. H. ISIS

Syriac chronicle of 569 (*Intr.*, 1, 457). New edition by BROOKS (C. S. C. O., Ser. Syr., Ser III, t. VI, text, versio). E. H. ISIS

VIIth Century (whole and first half)

Moreau, Edouard de (S. J.). SAINT-AMAND, apôtre de la Belgique et du Nord de la France. XI+367 p. Louvain, Editions du Museum Lessianum, 1927. ISIS

Reviewed by F. VERCAUTEREN, *Le moyen âge*, 37, 323-30, 1927.

VIIth Century (second half)

Baudot, Marcel. La question du pseudo-Frédégaire. *Le moyen âge*, vol. 38, 129-70, 1928. ISIS

Geographer of Ravenna (*Intr.*, 1, 496). Lin. 3 ist PTOLEMY zu streichen vgl. WILH. KUBITSCHEK: Itinerar-Studien, p. 50 (*Denkschr. Wien. Akad. Wiss.*, Bd. 61, 1919). Geogr. Rav. und Tab. Peut. stammen aus gemeinsamer Quelle. KUBITSCHEK in *Pauly-Wissowa*, s. Karten X, col. 2118. E. H. ISIS

Jacob of Edessa (*Introduction*, 1, 501). PAULIN MARTIN: L'Hexaméron

de JACQUES D'EDESSE (*Journal asiatique*, vol. 11, 155-219, 401-90, 1888). E. H. ISIS

Ruska, Julius. Ein dem CHÂLID IBN JAZÎD zugeschriebenes Verzeichnis der Propheten, Philosophen und Frauen, die sich mit Alchemie befassten. *Islam*, 18, 293-99 (received 1930). ISIS

VIIIth Century (second half)

Kankah. (*Introduction*, vol. 1, 521, 530). This KANKAH (not Mankah) was both an astronomer and an astrologer, a Jain and a native of Sindh. He was munajjim to AL-MANSÛR at Baghdâd. The name KANKAH is the European reading of the Arabic form of the original Sanskrit word Kanaka (gold). He was considered a specialist in « animal horoscopy » (viyonijanma in Skt.) In fact KALYANA-VARMAN quotes KANAKA as an authority in that field, and says that he merely repeats what KANAKA has said. The date of KALYANA-VARMAN is the beginning of the ninth century A.D. KALYANA-VARMAN was a prince and a reputable astrological author who followed in the main the teachings of the astrologers of the Eastern Roman Empire.
V. V. RAMANA-SASTRIN. ISIS

Ruska, Julius. The history and present status of the JABER problem. *Journal of Chemical Education*, 6, 1266-76, 1929. ISIS

IXth Century (whole and first half)

Aḥmad ibn Sirin (*Introduction*, 1, 558). *Ἀπομιαξάρ* lies *Ἀπομαξιάρ*? (Catal. cod. astr. gr. 11, 122, *Ἀπομάσαρ*). Vgl. *Ἀκσιάρα*=Aqshehir, *Πεγσιάρη*=Beishehir (*Byz. Z.*, 1, 269 f.) und *Ἀποχαψ*=ABÛ ḤAFṢ, *Ἀπολασάθ*=ABÛ-L-ASH'ATH : SYMEON MAGISTER, p. 741 s., ed. Bonn ; GEORGIOS MONACHOS, p. 834, ed. Muralt. Also sicher=ABÛ MA'SHAR. E. H. ISIS

'Alî ibn Rabbân al-Ṭabarî. Firdausu'l-ḥikmat, or Paradise of Wisdom. Edited by M. Z. SIDDIQI. Subsidized by the E. G. W. Gibb Memorial Trust. Printed in the Buchdruckerei Sonne, Berlin-Charlottenburg, 4, 1928. ISIS

This is the large Arabic treatise which the late E. G. BROWNE had planned to edit and perhaps translate, see my *Introduction* (vol. 1, 575). I hope to be able to speak of it at greater length in *Isis*. G. S.

Dvornik, F. Les Slaves, Byzance et Rome au IX^e^ siècle. v+360 p., Paris, CHAMPION, 1926. ISIS

Reviewed by AUGUSTIN FLICHE, *Le moyen âge*, 38, 91-94, 1928.

Ganshof, François L. Notes critiques sur EGINHARD, biographe de CHARLEMAGNE. 33 p. (Extrait de la *Revue belge de Philologie et d'Histoire*, 1924). Bruxelles, LAMERTIN, 1925. ISIS

Halphen, Louis. Études critiques sur l'histoire de CHARLEMAGNE. VIII+314 p. Paris, ALCAN, 1921. ISIS

Reviewed by L. LEVILLAIN, *Le moyen âge*, 33, 179-90, 1922.

al-Khwârizmî (*Introduction*, 1, 564). Geography. HANS V. MZIK: Beiträge zur Kartographie Albaniens nach orientalischen Quellen, in *Geologica Hungarica*, Series geologica, tom. 3, Abh. 1, 1929, 625-49 (darin 628-632 über Albanien auf AL-KH.s Karte, m. Abh. Fig. 151 auf p. 628); *idem*, Parageographische Elemente in den Berichten der arab. Geographen über Südostasien, in: *Beiträge zur historischen Geographie, Kulturgeographie, Ethnogr. u. Kartogr.* hrsg.v. H. v. MZIK, S. 172-202, mit Karte; meist über AL-KH. Leipzig, 1929. E. H. ISIS

al-Kindî. (*Introduction*, vol. 1, 559). You say that CARDAN considered AL-KINDÎ « as one of the twelve greatest minds. » You might have made it a little stronger, since in *De subtilitate*, XVI, 607, CARDAN sets out to list the ten leading intellects, among whom he places AL-KINDÎ, AL-KHOWARISMI and GEBER. Then as an afterthought he names GALEN as eleventh and VITRUVIUS as twelfth in importance. Therefore, strictly speaking, he regarded AL-KINDÎ as one of the ten leading minds. L. T. ISIS

Mzik, Hans v. Das Kitâb ṣurat-al-'arḍ des ABÛ JAFAR MUḤAMMED IBN MÛSÂ AL-KHUWÂRIZMÎ. Herausgegeben nach dem Handschriftlichen Unikum der Bibliothèque de l'Université et Régionale in Strassburg (cod. 4247). XXXI+197 p., 5 pl. London, HARRASSOWITZ, 1926. ISIS

Reviewed by H. HIRSCHFELD, *Journal of the Royal Asiatic Society*, 906, 1929.

Theophanes Confessor (*Introduction*, 1, 577). Continuatio lib. V= Vita BASILII imp., verfasst von KONSTANTIN VII. PORPHYROG. (vgl. z. B. LEOPOLD COHN, *Pauly-Wissowa* IV col. 1034 oben). E. H. ISIS

Walafrid Strabo (*Introduction*, vol. 1, 570). To the editions quoted add the one by LUDWIG CHOULANT (232 p., Leipzig, 1832), including

other texts of the same kind, the MACER FLORIDUS, poems by OTHO OF CREMONA and JOHN FOLCZ. L. T. ISIS

IXth Century (second half)

Giles, Lionel. Early Chinese printing. *British Museum Quarterly*, vol. 4, 86, 1929. ISIS

Very short note (14 lines). A third example of Chinese printing in the ninth century, coming from Tunghuang in Kansu, has been added to the British Museum collection. It is the initial portion of a block printed calendar for the year 882. The two other examples are dated 868 and 877; the first of these remains the oldest dated specimen of block printing. See SARTON's *Introduction* (vol. 1, 604). G. S.

Ibn Khurdâdhbih (*Introduction*, 1, 606). PAUL SCHWARZ, Die ältere geogr. Literatur der Araber, in : *Geogr. Zeitschr.* III, 137-46, 1897. J. RUSKA, *ibid.* 33, 519-28, 589-99, 1927 : Zur geogr. Literatur im islamischen Kulturbereich (524-28 : IBN KH.). E. H. ISIS

Xth Century (whole and first half)

Friedenwald, Harry. Manuscript copies of the medical works of ISAAC JUDAEUS. The diploma of a Jewish graduate of medicine of the University of Padua in 1695. *Annals of medical history*, 1, 629-39, 4 fig., 1929. ISIS

Ibn Rusta (*Introduction*, 1, 635). P. AMAND KYAS : Übersetzung ausgewählter Kapitel aus dem arabischen Geographen IBN RUSTA (Nach dem Originaltexte). In : *Jahresbericht des öffentlichen Stifts-Obergymnasiums der Benediktiner zu Braunau* in Böhmen am Schlusse des Schuljahres 1905, 3-63. E. H. ISIS

Ibn Serapion (*Introduction*, 1, 635). The name of that Muslim geographer was SUHRÂB. His Kitâb 'ajâ'ib al-aqâlîm will be edited by H. v. MZIK (*Bibl. arab. Hist. und Geogr.*, vols. 5 and 6). See A. R GUEST : The Delta in the Middle Ages (*Journal R. Asiatic Society* 1912, 941-80, 1913, 305-314). E. H. ISIS

Ibn Waḥshîya (*Introduction*, 1, 634). ALFRED VON GUTSCHMID, Die nabatäische Landwirtschaft mit ihre Geschwister in ZDMG 15, 1-110, 1861 ; Kleine Schriften, 2, 568-716. MARTIN PLESSNER, Der Inhalt der Nabatäischen Landwirtschaft. Ein Versuch, IBN WAḤSÎJA zu rehabilitieren, in : *Zeitschr. f. Semitistik*, 6, 27-56, 1928. E. H. ISIS

al-Qirqisânî (*Introduction*, 1, 626). Nicht « a native of Circassia » (*Jewish Encycl.*, 7, 509), sondern aus « al-Qirqisiyâ (Circesium), einer Stadt von al-Jazîra, 6 farsakh von Raḥbat Malik ibn Ṭaûq entfernt » (al-Sam'ânî, Kitâb al-ansâb, p. 448, E. J. W. Gibb Memorial, XX). Die Čerkessen hiessen damals Kasak oder Kashak (Jos. Marquart, Osteuropäische Streifzüge S. 175). E. H. ISIS

Runciman, Steven. The emperor Romanus Lecapenus and his reign. A study of tenth-century Byzantium. VI+276 p., 6 maps. Cambridge University Press, 1929. ISIS

Xth Century (second half)

Bar Bahlûl (*Introduction*, 1, 689). Notices alchimiques tirées du lexique syriaque de Bar Bahloul, in M. Berthelot : La chimie au moyen âge (vol. 2, 121-40, 1893). G. S. ISIS

Constantinos VII Porphyrogennetos (*Introduction*, 1, 657). Theophanes Confessor, Continuatio lib. V. = Vita Basilii imp., verfasst von Konst. VII, vgl. z. B. Leopold Cohn, *Pauly-Wissowa*, 4, col. 1034 oben. E. H. ISIS

Suidas (*Introduction*, 1, 691). Suidae Lexikon ed. Ada Adler, Pars 1, Leipzig, 1928 (*Lexicographi graeci*, 1). E. H. ISIS

XIth Century (whole and first half)

Asín Palacios, Miguel. Abenházam de Córdoba y su historia critica de las ideas religiosas. Tomo tercero. 333 p. Madrid, Tip. de la Rev. de Archivos, Bibliotecas y Museos, 1929. ISIS

The first and second volumes of this splendid publication appeared in 1927 and 1928 and were reviewed in *Isis*, 11, 168; 13, 155). The present volume contains the end of the first treatise of the Fiṣal, chaps. 16 to 25, and the second treatise in 20 chapters. The first treatise contains a violent discussion and denunciation of Christianity : criticism of the Gospels, comparison with the Jewish law, contradictions and lies contained in the Gospels, lies and blasphemies contained in other Christian books, Christian martyrs, Christian objections to Islâm and their falsity; etc. Chapters 23 and 24 are of special interest to us. The first of these, « Explanation of the problem of the sphericity of the earth, » claims that no Muslim doctor ever denied the sphericity, and that nothing is said against it either in the Qur'ân or in the ḥadîth. It is a little disappointing to find that the end of this chapter treating similar subjects and attempting to harmonize science and Islâm was left untranslated. Chapter 24, entitled « Explanation of the lies of those who would assign a determinate number of years to the duration

of the world », is a discussion of the Jewish and Christian ideas according to which the world would last only four or five thousand years. He says that he has heard of a Buddha which was 72000 years old, and of a city of India the age of which was 400.000 years ! Don MIGUEL is giving us not a literal translation but a free version. For example, he has omitted all the insults and blasphemies which caused the author's arguments to be very objectionable without adding anything to their strength. The second treatise deals with the Muslim sects. After two chapters of introduction, the author discusses a number of theological questions, opposing in each case the orthodox views to the others. I quote a few examples : unity, transcendentality, ubiquity of God, orthodox explanation of the anthropomorphical texts, divine essence, nature of the Qur'ân, divine inspiration of human actions, nature of freedom, etc. It is in fact a treatise on Muslim theology. G. S.

Byrhtferth. BYRHTFERTH's manual (A.D. 1011). Now edited for the first time from Ms. Ashmole 328 in the Bodleian Library. With an introduction, translation, sources, vocabulary, glossary of technical terms, appendices and seventeen plates. By S. J. CRAWFORD. Volume I. Text, translation, sources and appendices. 250 p. London, Published for the Early English Text Society by HUMPHREY MILFORD, 1929. ISIS

For this BYRHTFERTH, see SARTON's *Introduction* (vol. 1, 714). This first volume contains a critical edition of this very important text, and an English translation. A number of plates reproduce : The physical and physiological fours ; The signs of the zodiac ; The solstices, equinoxes, and the four elements ; The signs of the zodiac, the twelve months, the solstices, equinoxes, and the physiological fours ; etc. ; The Latin, Greek, and Hebrew alphabets ; The symbolical properties of the number five ; The symbolical properties of the number seven ; The symbolical properties of the numbers eight and nine ; The perfection of the number one thousand. These plates give one already an idea of the contents of this Manual. We shall postpone a fuller discussion of it until vol. 2, containing the introduction, vocabulary, glossary, etc. has appeared. It is hoped that this second volume will appear before the end of 1929. G. S.

Elias of Ṭîrhân (*Introduction*, 1, 737). Ṭîrhân (Gegend von Takrît am Tigris). E. H. ISIS

Wiedemann, Eilhard. Einleitung zu dem astronomischen Teil des Kitâb al schifâ (Werk der Genesung) von IBN SÎNÂ. (Beiträge zur Geschichte der Naturwissenschaften, 72). *Sitzungsber. der Physikalischmedizinischen Soz. zu Erlangen*, 58, 225-27, 1928. ISIS

Wiedemann, Eilhard. Über eine besondere Art des Gesellschaftsrechnens nach IBN AL-HAITHAM. (Beiträge zur Geschichte der

Naturwissenschaften, 68). *Sitzungsberichte der Physikalisch-medizinischen Sozietät zu Erlangen*, 58, 191-96, 1928. ISIS

XIth Century (second half)

Creutz, Rudolf. Der Arzt CONSTANTINUS AFRICANUS von Montekassino. *Studien u. Mitteilungen zur Geschichte des Benediktinerordens.* Neue Folge, Bd. 16, Heft 1, 1-44, 1929. ISIS

Evans-Wentz, W. Y. Tibet's great yogî MILAREPA. A biography from the Tibetan, being the Jetsün-Kahbum or biographical history of JETSÜN-MILAREPA, according to the late Lama KAZI DAWA-SAMDUP's English rendering. Edited with introduction and annotations by W. Y. EVANS-WENTZ. XX+315 p., 5 ills. Oxford University Press, 1929. ISIS

Reviewed by H. LEE SHUTTLEWORTH, *Journal of the Royal Asiatic Society*, 929-32, 1929. For a French translation of the same text by JACQUES BACOT (Paris, 1925,) see *Isis*, 10, 122. G. S.

Levé, A. La tapisserie de la reine MATHILDE, dite la Tapisserie de Bayeux. 212 p., 10 pl. Paris, LAURENS, 1919. ISIS

Reviewed by A. BOINET, *Le moyen âge*, 32, 79-82, 1921.

Odo of Meung (*Introduction*, vol. 1, 765). To the editions of MACER FLORIDUS ought to be added the one by LUDWIG CHOULANT: MACER FLORIDUS de viribus herbarum una cum WALAFRIDI STRABONIS, OTHONIS CREMONENSIS et IOANNIS FOLCZ carminibus similis argumenti (232 p., Leipzig, 1832). See LYNN THORNDIKE: *History of magic* (vol. 1, 612, 1923). ISIS

Potter, Ambrose George. A bibliography of the Rubaiyat of OMAR KHAYYAM. Together with kindred matter in prose and verse pertaining thereto. XIV+314 p. London, INGPEN and GRANT, 1929. ISIS

Seth (*Introduction*, 1, 771). *Μαγιστὴρ Ἀντιοχείας* « master of the palace built by ANTIOCHOS » (??). Vielmehr gewiss: Magistros des 969-1084 n. Chr. byzantinischen Antiocheia in Syrien (wie z. B. auch NIKEPHOROS URANOS *μαγ. Ἀντ.* war, vgl. KRUMBACHER, *Byz. L.-G.* 145, § 57, 3). Wo wird übrigens SYMEON SETH als *μαγ. Ἀντ.* bezeichnet? E. H. ISIS

Ts'ai Hsiang (*Introduction*, 1, 766). Valuable information on TS'AI

HSIANG (11519, 4266) is given by WALTER T. SWINGLE in the *Report of the Librarian of Congress* for 1928/29, p. 329-33, apropos of an excellent Ming edition of his collected writings, TS'AI Chung-hui kung wên chi (in 40 chüan) and of a supplementary collection, TS'AI Tuan ming pieh chi (in 10 chüan), both included in the Wang family library (for which see my note HUMMEL and SWINGLE, 1929, under China, below). G. S. ISIS

Wiedemann, Eilhard; Mittelberger, Theodor. Einleitung von AL ZARQÂLI zu einer Schrift über die nach ihm benannte Scheibe. (Beiträge zur Geschichte der Naturwissenschaften, 69). *Sitzungsber. der Physikalisch-medizinischen Soz. zu Erlangen*, 58, 196-202, 1928. ISIS

XIIth Century (whole and first half)

(Abraham bar Ḥiyya). ABRAAM BAR HIIA. Llibre revelador Meguillat Hamegallè. Segons l'edició del text revisat i prologat pel JULI GUTTMANN. Versió de l'Hebreu per J. MILLÀS I VALLICROSA. LVIII+ 252 p. (Biblioteca hebraico-catalana). Barcelona, Editorial Alpha, 1929. ISIS

Catalan translation of the Megillat-ha-megalleh (Scroll of the revealer), an astrological and messianic treatise of ABRAHAM BAR ḤIYYAH HA-NASI (often called SAVASORDA). That treatise was first edited by ADOLF POZNANSKI and JULIUS GUTTMANN for the Meqiẓe nirdamin (Berlin, 1924). Prof. J. MILLÀS I VALLICROSA has translated not only the Megillah itself but also GUTTMANN's Hebrew introduction and notes to it. As far as I know this is the first edition of that treatise in any European language, and it is very remarkable that that language should be Catalan. The book is beautifully got up and the printing seems to have been done with great care. G. S.

Conant, Kenneth John. Mediaeval academy excavations at Cluny. *Speculum*, 443-50, illus., 1929. ISIS

Efros, Israel. More about ABRAHAM B. HIYYAS' philosophical terminology. *Jewish Quarterly Review*, 20, 113-38, 1929. ISIS

Wiedemann, Eilhard; Kohl, Karl. Einleitung zu Werken von AL-CHARAQÎ. (Beiträge zur Geschichte der Naturwissenschaften, 70). *Sitzungsber. der Physikalisch-medizinischer Soz. zu Erlangen*, 58, 203-18, 1928. ISIS

This notice on AL-KHARAQÎ (d. 1138/39) will usefully complete the shorter one published by the same author in the *Encyclopaedia of Islam* (vol. 2, 903, 1926). It contains translations of the introductions to AL-KHARAQÎ's Muntahâ

and to his shorter treatise Tabṣira. Both introductions are interesting documents for the history of astronomy, especially for the history of IBN AL-HAITHAM's conception of the celestial spheres. G. S.

XIIth Century (second half)

Ivanow, W. Faraḥ-nâma-i-jamâlî. *Journal of the Royal Asiatic Society*, 863-68, 1929. ISIS

The Faraḥ-nâma-i-jamâlî was intended as a supplement to the Nuzhat-nâma-i-'Alâ'î by SHÂHMARDÂN IBN ABÎ-L-KHAYR (completed c. 1095-1119). It was itself completed in 1184 or 1201 by ABÛ BAKR IBN AL-MUẒHIR IBN MUḤAMMAD. Both works are generally called encyclopaedias of useful or natural sciences, but in fact their contents are mostly magical. « They give an invaluable compendium of all possible superstitions, connected with every form of the organic and inorganic world, numbers, forms of divination, dreams, and some crafts. Very often scarcely disguised survivals of pre-Muhammadan popular beliefs in Persia seem to be found. A student of Persian folklore may regard these two works as precious documents, especially in view of their strikingly unrestricted spirit, which appears quite emancipated from all the bonds of orthodox Muhammadan prejudice. »

Konstantinowa, Alexandra. Ein englisches Bestiar des 12. Jahrhunderts in der Staatsbibliothek zu Leningrad. Mit einem Vorwort von ADOLPH GOLDSCHMIDT. 32 p. (*Kunstwiss. Studien*, IV). Berlin, Deutscher Kunstverlag, 1929. ISIS

Reviewed by ZAUNICK, *Mitteilungen zur Geschichte der Medizin und der Naturwissenschaften*, 29, 23, 1930.

Meyerhof, Max. L'œuvre médicale de MAIMONIDE. *Archeion*, 11, 136-55, 1929. ISIS

Conférence faite devant l'Association internationale de la jeunesse juive au Caire le 9 mai 1929. Courte biographie et exposé de l'œuvre médicale de MAIMONIDE. L. G.

Sudhoff, Karl. Commentatoren der Harnverse des GILLES DE CORBEIL. *Archeion*, 2, 129-35, 1929. ISIS

XIIIth Century (whole and first half)

Haskins, Charles H. Magister GUALTERIUS ESCULANUS. Mélanges d'histoire du moyen âge offerts à FERDINAND LOT, 245-57, Paris, 1925. ISIS

« WALTER OF ASCOLI was the author of an etymological dictionary bearing the title Dedignomium, Summa derivationum or Speculum artis grammatice, of which four MSS. are known. » He flourished at Naples in 1228. He had begun his dictionary at Bologna and completed it at Naples. Apropos

of this and other literary efforts of South Italy, HASKINS concludes « Whereas the triumph of logic crushed the literary revival north of the Alps, this is not true in the same degree of Italy. where Latin literature was cultivated in the thirteenth century in increasing measure and in styles which already suggest the Quattrocento. In order to understand the origins of the Italian Renaissance, we must take account of many elements, social and artistic as well as literary, but the continuity of literary studies from the thirteenth century is a point which must not be wholly ignored. On the side of Latin as well as of Greek, these antecedents of the fifteenth century call for further investigation. »

Katterbach, Bruno ; Pelzer, Augustus ; Silba-Tarouga, Carolus. Exempla scripturarum edita consilio et opera procuratorum Bibliothecae et tabularii Vaticani. Fasc. 1. Codices latini saeculi XIII. 36 p., 32 pl. Rome, Bibliotheca Vaticana, 1929. ISIS

Landry, B. L'originalité de GUILLAUME D'AUVERGNE. *Rev. d'histoire de la philosophie*, 3, 441-65, 1929. ISIS

« L'œuvre entière de GUILLAUME D'AUVERGNE est une réaction énergique contre les doctrines arabes qui, sous le couvert d'ARISTOTE, tentaient de s'infiltrer dans la pensée chrétienne... Mais un polémiste subit souvent les intentions de ceux qu'il réfute ; il se pourrait donc que GUILLAUME, à son insu, dût beaucoup à ses perpétuels adversaires. La question est d'importance ; car la constatation d'un premier apport arabe à la philosophie chrétienne permettrait peut-être de jeter quelque lumière sur la signification profonde de la scolastique latine du XIII^e siècle ». Et en fait, l'auteur trouve chez GUILLAUME D'AUVERGNE la doctrine de IBN GABIROL. L. G

Mackay, Dorothy Louise. Les hôpitaux et la charité à Paris au XIII^e s. 168 p., frontispice, 5 pl. Paris, CHAMPION, 1923. ISIS

Reviewed by LÉON LE GRAND, *Le moyen âge*, 34, 310-11, 1923.

Muḥammad al-'Awfī. Introduction to the Jawâmi' al-ḥikâyât wa lawâmi' al-riwâyât of MUḤAMMAD AL-'AWFÎ by MUḤAMMAD NIẒAM AL-DÎN (*Gibb Memorial series*, New series, 8). XIX+316 p. London, 1929. ISIS

Rosenblatt, Samuel. The Highways to perfection of ABRAHAM MAIMONIDES. 214 p. (*Columbia University Oriental Studies*, vol. 27) New York, Columbia University Press, 1927 ($ 3.50). ISIS

ABRAHAM BEN MOSES IBN MAIMÛN (1186-1237) has been entirely eclipsed by his illustrious father MAIMONIDES ; that eclipse is somewhat undeserved because he was in his own right a very distinguished, if not an original, philosopher. His main work was the Kitâb al-kifâya tal-'ibdân, The sufficient book for the servants (of God), divided into ten parts. Some fragments of it had been published before, but this is the first edition of the ninth part,

rightly entitled (by the present editor) The highways to perfection. Indeed the author « intended in these chapters to outline a special course of life, a particular regimen of acting and thinking, which is contained in the inner meaning and aim of the precepts of the Torah—going beyond the observance of its commandments in their exoteric sense—and which enables those following it to attain the highest degree of human perfection possible. » This ninth part constitutes chapters 11 to 23 of the fourth section, as follows : 11, permanent legal way (of life); 12. noting what the elevated paths have in common; 13. on the sincerity of actions; 14. on mercy; 15. on generosity; 16. on gentleness; 17. on humility; 18. on faith; 19. on contentedness; 20. on abstinence; 21. on the war (against the self); 22. on the government of the faculties and their control to serve their noble end; 23. on solitude.

ABRAHAM was educated by his father and in 1205 succeeded him in the negiduth, the highest Jewish office of Egypt. He was a court physician, and well acquainted not only with medicine but also with Aristotelian science in all its aspects. He was intensely pious, but not superstitious. This edition and translation is preceded by a long study (128 p.) on the MSS., ABRAHAM's time and philosophy, his contact with Sufism, etc. Note the interesting biographical addenda in the supplement (p. 123-28).

Our only regret is that the Arabic text is printed in Hebrew type. This may be justified by the fact that the MSS. are written in Hebrew script, but such justification is insufficient. The Hebrew transliteration is never entirely free from ambiguities; it increases the difficulty or discomfort of the Arabic reader who is not very familiar with Hebrew, without making it at all easier to the Hebrew reader whose Arabic is weak. To edit an Arabic text in Hebrew type, because some MSS. were written that way, is in my opinion, pure pedantism (or laziness). Such a text ought to be printed in Arabic script, with the necessary Hebrew variants in the footnotes. However we must be grateful to the author for this handsome and careful edition.

G. S.

XIIIth Century (second half)

(Aquinas, Thomas). The Summa contra gentiles of Saint THOMAS AQUINAS. The fourth book. Literally translated by the English Dominican fathers. IX+321 p. London, BURNS, OATES, 1929. ISIS

Belmond, E. DUNS SCOT métaphysicien. *Revue de philosophie*, 29, 405-23, 1929. ISIS

Bratianu, G. I. Recherches sur le commerce génois dans la Mer Noire au treizième siècle. VIII+359 p., 5 pl., map. Paris, GEUTHNER, 1929. ISIS

Hocedez, Edgar. RICHARD DE MIDDLETON, sa vie, ses œuvres, sa doctrine. XVI+555 p. (*Spicilegium sacrum Lovaniense*, 7.) Louvain, Spicilegium, 1925. ISIS

Reviewed by AUGUSTIN FLICHE, *Le moyen âge*, 37, 196-98, 1927.

Mackay, Dorothy Louise. Le système d'examen du XIII^e siècle, d'après le De conscientia de ROBERT DE SORBON. Mélanges d'histoire du moyen âge offerts à FERDINAND LOT, 491-500, Paris, 1925. ISIS

(Polo, Marco). The most noble and famous travels of MARCO POLO, together with the Travels of NICOLÓ DE' CONTI. Edited from the Elizabethan translation of JOHN FRAMPTON, with introduction, notes, and appendixes by N. M. PENZER. London, Argonaut Press, IX+381 p., 1929. ISIS

Powicke, F. M. Master SIMON OF FAVERSHAM. Mélanges d'histoire du moyen âge offerts à FERDINAND LOT, 649-58, Paris, 1925. ISIS

SIMON OF FAVERSHAM was an Oxford scholar who lived in the reign of EDWARD I; he died in 1306. He wrote commentaries and questions on ARISTOTLE's Physics.

Scherer, Wilhelm. Des seligen ALBERTUS MAGNUS Lehre von der Kirche. VIII+141 p. (Freiburg, theolog. Stud. Hrsg. v. ARTH. ALLGEIER, ENGELB. KREBS u. and., H. 32.) Freiburg, HERDER, 1928. ISIS

Reviewed by J. KOCH, *Deutsche Literaturzeitung*, 6, 2046-47, 1929.

Tischleder, Peter. Die geistesgeschichtliche Bedeutung des heiligen THOMAS VON AQUIN für Metaphysik, Ethik und Theologie. VIII+38 p. Freiburg, HERDER, 1927. ISIS

Wiedemann, Eilhard. Zu der Redaktion von EUKLIDS Elementen durch NAṢÎR AL-DÎN AL ṬÛSÎ. (Beiträge zur Geschichte der Naturwissenschaften, 73). *Sitzungsber. der Physikalisch-medizinischen Soz. zu Erlangen*, 58, 228-36, 1928. ISIS

Apropos of NAṢÎR AL-DÎNS Taḥrîr al-uṣûl. Contains the translation of his preface and of the beginning of the first book, with notes. G. S.

Wiedemann, Eilhard (1852-1928). NAṢÎR AL-DÎN AL ṬÛSÎ. (Beiträge zur Geschichte der Naturwissenschaften, 78). *Sitzungsberichte der Physikalisch-medizinischen Sozietät zu Erlangen*, Band 60, 289-316, 1928. ISIS

This posthumous paper was prepared for publication by JULIUS RUSKA. It is incomplete and unequal but adds a number of facts to our knowledge. It is divided as follows: Biography. Astronomy (this is the longest section,

p. 295-307). Astrology. Geomancy. Mathematics. Physics. Medicine. Philosophy. Bibliography. This paper reached me when my own note on NÂSIR AL-DÎN for vol. 2 of my *Introduction* had already been written and rewritten. It obliged me to insert a few additions, but I did not make as full a use of it as I would have done if it had been available to me at an earlier stage of my work. G. S.

Wiedemann, Eilhard. Über eine Schrift über die Bewegung des Rollens und die Beziehung zwischen dem Geraden und dem Gekrümmten von QUṬB AL DÎN MAḤMÛD B. MAS'ÛD AL SCHÎRÂZÎ. (Beiträge zur Geschichte der Naturwissenschaften. 71). *Sitzungsber. der Physikalisch-medizinischen Soz. zu Erlangen*, 58, 219-24, 1928. ISIS

« In einer grossen Anzahl mathematischer Schriften der Araber sind prinzipielle Untersuchungen enthalten, die sich u. a. auf die Axiome des EUKLID, auf schwieriege und unklare Stellen in den Elementen u. s. f. beziehen. Es sind diese Untersuchungen, die vielfach an ganz moderne Betrachtungen anklingen. » « Hierher gehört auch die Frage nach dem Verhältnis von der krummen zu der geraden Linie, die in dem Paradoxen gipfelt, ob die gerade Linie wirklich kürzer ist als der Bogen. Dies Problem kommt bei den Arabern darauf hinaus, ob eine krumme und eine gerade Linie sich überdecken können, da man nur dann eine Gleichheit oder Ungleichheit beider feststellen kann. Zu der Überdeckung ist aber nötig, dass die beiden in Frage kommenden Gebilde von einer Art sind. Es zeigt sich, dass man zwischen einer Überdeckbarkeit im engeren Sinn des Wortes und einer allgemeinen (muṭlaq) zu unterscheiden hat. »

Wiedemann, Eilhard. Zum Leben von NAṢÎR AL-DÎN AL ṬÛSÎ. (Beiträge zur Geschichte der Naturwissenschaften, 75). *Sitzungsber. der Physikalisch-medizinischen Soz. zu Erlangen*, 58, 363-79, 1928. ISIS

XIVth Century (whole and first half)

Arquillière, X. A. Le plus ancien traité de l'Église. JACQUES DE VITERBE, De regimine christiano, 1301-02. Étude des sources et édition critique. 314 p. Paris, BEAUCHESNE, 1926. ISIS

Reviewed by ROBERT LATOUCHE, *Le moyen âge*, 38, 89-91, 1928.

Froehner, Reinhard. Das Nacerische Buch des ABU BEKR IBN BEDR. Beitrag zur Kenntnis der mittelalterlichen orientalischen Veterinärmedizin. *Arch. Tierheilk.*, 60, 362-75, 1929. ISIS

Reviewed by SCHMUTZER, *Mitteilungen zur Geschichte der Medizin und der Naturwissenschaften*, 29, 51, 1930.

Karpinski, Louis C. The Italian arithmetic of Master JACOB OF FLORENCE, 1307. *Archeion*, 11, 170-77, 2 pl., 1929. ISIS

Examen, d'après le Ms. latin 4826 de la Bibliothèque Vaticane, de l'œuvre de JACOB DE FLORENCE : numération, multiplication, division, fractions, questions d'algèbre, problèmes et règles de mensuration, et extraction de racines. On y trouve les six types d'équations du degré 1 et 2 déjà donnés par AL-KHOWARIZMI, et 14 autres types des degrés 3 et 4. Comparaison avec l'œuvre de LÉONARD DE PISE, sur qui il marque très peu de progrès, et avec PHILIPPUS CALANDRI (1481 et 1517) dont le travail ressemble beaucoup à celui de Maître JACOB. L. G.

Karrer, Otto. Das Göttliche in der Seele bei MEISTER ECKHART. IV+127 p. (*Abh. z. Philosophie u. Psychologie d. Religion*. Hrsg. v. GEORG WUNDERLE, H. 19). Würzburg, BECKER, 1928. ISIS

Reviewed by MAX PAHNCKE, *Deutsche Literaturzeitung*, 6, 1805-06, 1929.

Koch, Joseph. DURANDUS DE S. PORCIANO O. P. Forschungen zum Streit um THOMAS VON AQUIN zu Beginn des 14. Jahrhunderts. 1. Tl. : Literargeschichtl. Grundlegung. XV+436 p. (*Beitr. z. Gesch. d. Philos. d. Mittelalt.*, begr. v. CL. BAEUMKER, hrsg. v. M. GRABMANN u. a.) Münster i. W., ASCHENDORFF, 1927. ISIS

Reviewed by REINHOLD SEEBERG, *Deutsche Literaturzeitung*, 6, 2237-39, 1929.

Ockham, William of. The De imperatorum et pontificum potestate of WILLIAM OF OCKHAM hitherto unpublished, now edited by C. KENNETH BRAMPTON. XXXVIII+108 p., fâcs. Oxford, Clarendon Press, 1927. ISIS

Reviewed by EMILE A. VAN MOÉ, *Le moyen âge*, 37, 316-18, 1927.

Sudhoff, Karl. Über eine provençalische Chirurgie eines STEPHANUS « ALDEBALDI » aus Montpellier um 1340-50. *Janus*, 33, 191-8, 1929. ISIS

Cette Chirurgie est extraite d'un Ms. de Bâle. STEPHANUS ALDEBALDI (fils de Aldebald) est peut-être ETIENNE ARLAND (ou ARNAUD) de Montpellier, ou STEPHANUS ACHELLINI = ANCHELINI = ANCHELMI. L. G.

Vossler, Karl. Mediaeval culture : an introduction to DANTE and his times. Translated by WILLIAM CRANSTON LAWTON. Two volumes. X+354 p. ; X+454 p. New York, HARCOURT, BRACE, 1929. ISIS

Reviewed by K. MCKENZIE, *American Historical Review*, 35, 93-4, 1929.

XIVth Century (second half)

Janicsek, Stephen. IBN BATTUTA's journey to Bulghar : is it a fabrication ? *Journal of the Royal Asiatic Society*, 791-800, 1929. ISIS

« In my opinion, the trip to and from Bulghar which IBN BATTUTA claims

to have undertaken is the only narrative in the whole record of his wanderings which seems to be, beyond all doubt, a falsification. »

XVth Century (whole and first half)

Krenkow, F. Arabische Berichte über Goldgruben und Schlafsucht im Nigerlande. *Sitzungsber. der Physikalisch-medizinischen Soz. zu Erlangen*, 58, 344-47, 1928. ISIS

Two extracts from the Ṣubḥ al-a'shâ of AL-QALQASHANDÎ. Says the author « Es ist, soviel ich weiss, die älteste Nachricht über die Goldindustrie im Nigerlande und die Schlafsucht, die uns jetzt ja nicht nur in Afrika, sondern auch in Europa so viele Sorge macht. » The items reported refer respectively to the years 1334 and 1373 (a man died of the sleeping sickness in that year).

Lippmann, Edmund O. von. Alchemistisches aus MAKRIZI's « Beschreibung Aegyptens ». *Chemiker-Zeitung*, 54, 2, 1930. ISIS

Sarton, George. Science in the Renaissance. The Civilization of the Renaissance, 75-95, University of Chicago Press, 1929. ISIS

One of four lectures delivered at Mount Holyoke College, Massachusetts.

Thompson, James Westfall. Exploration and discovery during the Renaissance. The Civilization of the Renaissance, 5-42, University of Chicago Press, 1929. ISIS

One of four lectures delivered at Mount Holyoke College, Massachusetts.

XVth Century ((second half)

Ballard, James F. A catalogue of medical incunabula contained in the William Norton Bullard Loan Collection deposited in the Boston Medical Library. VIII+77 p., ills. Boston, privately printed, 1929. ISIS

Beautiful catalogue of a collection of 179 medical incunabula. « The books have been collected with the definite idea of bringing together the works on medicine and related sciences which were printed in the fifteenth century. Particular attention has not been given to printers or presses and very little stress placed on first editions, except in a few instances. The medieval student's greatest need was dictionaries to interpret the new words flowing into the language from foreign sources. Medical terms and definitions are contained in most of the fifteenth century dictionaries and for this reason the Bullard Collection includes many examples of this class of book. The Arabian authors are very well represented, and the collection is also strong in the philosophical field of medicine as evidenced by the numerous texts of ALBERTUS MAGNUS, NIDER, SABUNDE, and others, and of ARISTOTLE and his various commentators. Of special interest are the pest tracts and the various works on witchcraft, demons, sorcery and divination. »

Brunschwig, Alexander. HIERONYMUS BRUNSCHWIG of Strassburg, *Annals of Medical History*, 1, 640-44, 1 pl., 3 fig., 1929. ISIS

Commynes, Philippe de. Mémoires édités par JOSEPH CALMETTE, avec la collaboration du chanoine G. DURVILLE, vol. 1, 1464-1474. XXXVI+257 p. (*Les classiques de l'histoire de France au moyen âge* publiés sous la direction de LOUIS HALPHEN, fascicule 3). Paris, CHAMPION, 1924. ISIS

Reviewed by ROBERT LATOUCHE, *Le moyen âge*, 35, 294-95, 1924-25.

Friederici, Georg. Die vorkolumbischen Verbindungen der Südsee-Völker mit Amerika. p. 27-51, map, 4 fig. (Sonderabdruck aus *Mitt. aus d. dtsch. Schutzgebieten*, hrsg. v. H. MEYER, A. PENCK, P. STAUDINGER. Bd. 36, H. 1). Berlin, MITTLER, 1928. ISIS

Reviewed by MARTIN GUSINDE, *Deutsche Literaturzeitung*, 6, 1925-27, 1929.

Karl, Louis. Notice sur une recette alchimique de l'or attribuée au roi MATHIAS CORVIN. *Archeion*, 11, 206-09, 1929. ISIS

Publication (Ms. 992 du Musée de Chantilly) et commentaire de la première fabrication d'un élixir de vie qui devait préserver le roi MATHIAS de Hongrie.

Killermann, Seb. Das Tierbuch des PETRUS CANDIDUS, geschrieben 1460, gemalt im 16. Jahrhundert (Codex Vaticanus Urb. lat. 276). *Zoologische Annalen*, 6, 113-221, 8 pl. 1914. ISIS

Miller, William. The last Athenian historian: LAONIKOS CHALKOKONDYLES. *Journal of Hellenic Studies*, 42, 36-49, 1922. ISIS

Wright, R. Ramsay. Über die Schrift 'Astronomica quaedam' von GREAVES. Mit einem Zusatz von EILHARD WIEDEMANN (Beiträge zur Geschichte der Naturwissenschaften, 77). *Sitzungsber. der Physikalisch-medizinischen Soz. zu Erlangen*, 58, 381-86, 1928. ISIS

Apropos of the Astronomica quaedam ex traditione Shah Cholgii Persiae etc. by JOHN GREAVES (London, 1650) containing part of a commentary on the Zîj-i-Ilkhânî of NAṢÎR AL-DÎN AL-ṬÛSÎ by MAḤMÛD SHÂH KHULJÎ.

Leonardo da Vinci

Feldhaus, Gilbert W. Eine Fahrt zum Todesort von LEONARDO DA VINCI. *Archeion*, 11, 216-23, 1929. ISIS

Mauclair, Camille. LÉONARD DE VINCI. 136 p., 24 pl. (*Maîtres anciens et modernes*, sous la direction de GUSTAVE GEFFROY.) Paris, NILSSON, 1929. ISIS

Reinach, Salomon. An unedited portrait of LEONARDO. *Studio*, Nov. 1929, 47-49, 5 portraits. ISIS

Apropos of a portrait in the Museum of Cherbourg, of LEONARDO at about the age of forty, after a lost drawing. G. S.

Salomon, Wilhelm. Geologische Beobachtungen des LEONARDO DA VINCI. 13 p. (*Sitzungsber. Heidelberger Akad. Wiss., Math.-nat. Kl.* 1928, Abh. 8). Berlin, W. DE GRUYTER, 1928. ISIS

XVIth Century (whole and first half)

D. — *Medical Sciences*

Andel, M. A. van. Griep in de 16e eeuw. *Bijdragen tot de geschiedenis der geneeskunde*, 9, 328-33, 1929. ISIS

Herczeg, Arpad. JOHANNES MANARDUS, Hofarzt in Hungarn und Ferrara im Zeitalter der Renaissance. *Janus*, 33, 52-78, 85-130, 2 pl., 1929. ISIS

J. MANARDUS (1462-1536), médecin à Ferrara, puis auprès de LADISLAS VI, roi de Hongrie, et de nouveau à Ferrara, doit être considéré comme un des restaurateurs de la science. L. G.

Hohenheim, Theophrast von. PARACELSUS. Sämtliche Werke. 1. Abtlg. Medizinische, naturwissenschaftliche und philosophische Schriften, hrsg. von KARL SUDHOFF. Bd. 12. Astronomia magna oder die ganze Philosophia sagax der grossen und kleinen Welt samt Beiwerk. Erklärung der (Nürnberger) Papstbilder, angeblich des Abtes JOACHIM VON FIORE. VIV+629 p., 1 pl., 36 fig., München, OLDENBOURG, 1929. ISIS

Walsh, James J. Early pharmaceutics in America. *Medical life*, 36, 508-20, 1929. ISIS

E. — *Alia*

Alcala, Pedro de (fl. 1505). Arte para ligeramente saber la lengua arauiga. Printed by JUAN VARELA of Salamanca in Granada, 1505. Microphotographic reproduction. 75 p. New York, Hispanic Society, 1928. ISIS

This reproduction is not quite as small as the one of COVARRUBIAS's Tesoro (for which see my note under XVII (1) E). It also contains nine original pages on each page but the size of the latter being larger, the facsimile can be read more easily, even if necessary without a glass. It is a pity that such facsimile was not accompanied by an introduction explaining however briefly

the importance of ALCALA's work. It was the first Arabic grammar and dictionary to appear in print (Granada, 1505); the dictionary is Spanish-Arabic, not the other way. (See my *Introduction*, vol. 1, 783). PEDRO DE ALCALA was a Hieronymite (not a Franciscan) who flourished in Granada; he was confessor of FERNANDO OF TALAVERA, first archbishop of Granada (d. 1507), who belonged to the same order; he completed his work in 1505. If the American editors were too lazy to do more, they might at least have referred to the previous edition by PAUL DE LAGARDE: PETRI HISPANI De lingua arabica libri duo (Göttingen, 1883) which includes a short Latin preface. G. S.

Cantera Burgos, F. El libro de la cabala de ABRAHAM BEN SALOMON DE TORRUTIEL y Un fragmento histórico de JOSÉ BEN ZADDIC DE ARÉVALO: traducción española, prologo y notas de F. CANTERA BURGOS. 71 p. Salamanca, 1928. ISIS

Reviewed by RAPHAEL LEVY, *Journal of the Royal Asiatic Society*, 209-11, 1929.

Dürer, Albrecht. Festschrift des Vereins für Geschichte der Stadt Nürnberg zur 400-jährigen Gedächtnisfeier ALBRECHT DÜRERS. 1528-1928. VI+426 p., 45 pl. (*Mitteilungen des Vereins für Geschichte der Stadt Nürnberg*. Herausgeg. von EMIL REICKE, 28. Bd.) Nürnberg, SCHRAG, 1928. ISIS

Reviewed by ERICH ROEMER, *Deutsche Literaturzeitung*, 6, 1823-29, 1929.

Ferguson, John (1837-1916). The Margarita philosophica of GREGORIUS REISCH. p. 194-216, 4 fig. Transactions of the Bibliographical Society, The Library, London, Sept. 1929. ISIS

Very minute description of the editions of that encyclopaedia. Ten Latin editions, from 1503 to 1583; one Italian, in 1599. It was prepared by the late JOHN FERGUSON in 1900. G. S.

XVIth Century (second half)

A. — *Mathematics*

Agostini, A. Un commento su DIOFANTO contenuto nel Mss. palat. 625. *Archeion*, 11, 41-54, 1929. ISIS

PIETRO CORSALI (1797), G. LIBRI (1840) signalent ce Ms. de la bibliothèque nationale centrale de Florence, mais sans en avoir identifié l'époque et l'auteur. AGOSTINI l'attribue à ANTONIO MARIA PAZZI, qui l'aurait écrit entre 1567 et 1572, alors qu'il était professeur à Rome; ce commentaire serait d'ailleurs le résultat d'une étude commune faite par BOMBELLI et PAZZI. L. G.

Bortolotti, Ettore. Costruzione geometrica di formule algebriche

presso gli algebristi della antica scuola italiana. *Periodoco di mat.*, 9, 161-6, 1929. ISIS

Sur les constructions géométriques de R. BOMBELLI.

Vetter, Quido. JIRIK GOERL z Goerlsteyna a GEORG GEHRL von Elnbogen. 16 p., 5 fig. Cislo 94, Praha, Rok 1929. ISIS

Article en polonais suivi d'un résumé français, se rapportant à JIRIK GOERL (alias GEORG GEHRL) de Elnbogen sur l'Elbe. Mathématicien tchèque qui a publié une arithmétique en allemand en 1577, et une édition remaniée en tchèque la même année. Il est mort après 1588. Voir *Isis*, 12, 364. G. S.

C. — *Natural Sciences*

Castries, Henry de (1850-1927). En-nafhat el-miskiya fi-s-sifarat et-tourkiya. Relation d'une ambassade marocaine en Turquie, 1589-1591 par ABOU-L-HASAN ALI BEN MOHAMMED ET-TAMGROUTI. Traduite et annotée. XVI+130 p. (Publications de la section historique du Maroc. Documents d'histoire et de géographie marocaines). Paris, GEUTHNER, 1929 (50 frs.) ISIS

The author of this relation was born in Tamgrout c. 1560, and died in Merrakech, in 1594/95; he was sent by the sultan of Morocco to the sultan of Constantinople and wrote an account of his journey whereof extracts are here translated into French. He borrowed considerably from the accounts of earlier travelers, (chiefly AL-BAKRÎ, of Cordova, IBN 'ABD RABBIH of Cordova, and still another Andalusian, ABÛ-L-BAQÅ'KHÂLID), and the purely geographical interest of his own work is very small. The Arabic text is represented by a single Ms. of late date (1716). Brief Arabic glossary of technical terms G. S.

D. — *Medical Sciences*

Power, Sir D'Arcy. The beginnings of the literary renaissance of surgery in England. *Proceedings of the Royal Society of Medicine* (section of the history of medicine), 22, 77-82, London, 1928. ISIS

POWER says there was no surgical literature in the fifteenth century but that after the Barbers and Surgeons were united in 1540, books began to appear almost at once. There were various translations, such as JOHN HALL's English edition of LANFRANC's Chirurgia Parva and those of JOHN READ. The most important book, which had a widespread influence, was the translation of JOHN OF VIGO's Practica in Arte Chirurgica. POWER gives a number of details about the supposed translator, BARTHOLOMEW TRAHERON, RICHARD TRACEY, to whom the book was dedicated, and EDWARD WHITCHURCH, the publisher. H. R. V.

Trénel. La galerie des portraits de demi-fous et d'aliénés de TALLEMANT

DES RÉAUX. *Bulletin de la société française d'histoire de la médecine*, 23, 205-36, 1929. ISIS

E. — *Alia*

Freshfield, E. H. Notes on a vellum album containing some original sketches of public buildings and monuments, drawn by a German artist who visited Constantinople in 1574. *Archaeologia*, 72, 87-104, 8 pl., 1922. ISIS

Robinson, George W. Autobiography of JOSEPH SCALIGER (1540-1609). With autobiographical selections from his letters, his testament, and the funeral orations by DANIEL HEINSIUS and DOMINICUS BAUDIUS. Translated into English for the first time with introduction and notes. 128 p., 4 pl., Cambridge, Harvard University Press, 1927. ISIS

XVIIth Century (whole and first half)

A. — *Mathematics*

Heilbronn, Isak. Die mathematischen und naturwissenschaftlichen Anschauungen des JOSEF SALOMO MEDIGO. *Inauguraldissertation.* 94 p., 17 fig. Erlangen, 1913. ISIS

JOSEF SALOMO DEL MEDIGO (Candia, 1591—Prag, 1655). The greatest part of this study is devoted to algebra and spherical trigonometry. « Für die Juden hat mit dem 16. Jahrhundert noch keine neue Zeit begonnen. Nur eine Wissenschaft gab es für sie — das war das Studium der Thorah und des Talmud. Eine Ausnahme hiervon machten teilweise die italienischen Juden, von denen schon damals einige die Universitäten besuchten. Es dürfte daher eine dankenswerte Aufgabe sein, einmal zu erforschen, in welcher Weise sich der Übergang vom Mittelalter zur Neuzeit in den Werken eines Juden spiegelt, der seinen Neigungen folgend sich mit Mathematik und Naturwissenschaften beschäftigt hat. Eine solche Persönlichkeit tritt uns in JOSEF SALOMO DEL MEDIGO entgegen. » G. S.

Surico, L. Antonio. L'interpretazione di $y=x^n$ per n negativo razionale, diverso da -1, di EVANGELISTA TORRICELLI; definitivo riconoscimento della priorita torricelliana in questa scoperta. *Archeion*, 11, 64-83, 1929. ISIS

La priorité pour la cubature des solides ronds et la quadrature de l'hyperbole appartient, non pas à FERMAT, mais à TORRICELLI. L. G.

C. — *Natural Sciences*

Zaunick, Rudolph. Nachtrag zu GUDGERS Arbeit über GEORG MARCGRAVE. *Zoologische Annalen*, 7, 193-95, 1916. ISIS

D. — *Medical Sciences*

Mendelssohn, Martin. Das Herz, ein sekundäres Organ. Eine Kreislauftheorie. 84 p. Berlin, A. JUNCKER, 1928. ISIS

There have been so many panegyrics of HARVEY on account of his centenary, that it is hardly worthwhile to try to mention them all. But here is something more original : a book against HARVEY ! G. S.

Pfeilsticker, Walther. JOHANNES RÜMELIN (1583-1632). *Archiv für Geschichte der Medizin*, 22, 174-88, 1 illus., 1929. ISIS

Pfeilsticker, Walther. JOHANNES RÜMELIN. Nachtrag. *Archiv für Geschichte der Medizin*, 22, 382-92, 1929. ISIS

Pybus, F. C. The Company of barber surgeons and tallow chandlers of Newcastle-on-Tyne. *Proceedings of the Royal Society of Medicine*, (section of the history of medicine), 22, 297-300, London, 1929. ISIS

PYBUS has extracted from the Minute book (1616-1686) of the Company of Barber Surgeons of Newcastle-on-Tyne some data in regard to the expenses of the company in the seventeenth century, the teaching of anatomy, dissection, fines, the surgical instruments used and the books in their library. Many of the important notes are incorporated in the paper as well as illustrations of the old buildings and the coat of arms of the company.

H. R. V.

E. — *Alia*

Aubanel, Pierre. Le génie sous la tiare. URBAIN VIII et GALILÉE. 285 p. Paris, FAYARD, 1929. ISIS

P. AUBANEL a entrepris l'« apologie » d'URBAIN VIII (1623-44), pour lui « un des cerveaux les plus puissants » de son époque, « grand humaniste et grand savant tout ensemble, et par sa théorie de l'attraction lunaire que que combattait GALILÉE, le défenseur de la vérité scientifique, le précurseur de nos savants modernes », en un livre parfois confus, riche de documents, et qui prend comme centre les rapports de GALILÉE avec URBAIN VIII et son entourage, tout ce monde étant assez nettement situé par rapport à l'époque troublée où il vécut, par rapport aux systèmes philosophiques en honneur aux temps de PAUL V, GRÉGOIRE XV et URBAIN VIII. L'auteur conserve-t-il toujours la sérénité nécessaire pour juger un tel procès ? Le fait qu'il traite (p. 153) de « folies » le rationalisme, la philosophie mécanistique de SPINOZA, permet d'en douter. — Quelques lacunes : AUBANEL déclare par exemple dans sa préface, à propos de ceux qui l'ont précédé dans l'étude du procès de GALILÉE : « HENRI DE L'EPINOIS possède une documentation incomparable, mais ne l'utilise pas »; on aimerait pouvoir se reporter à cette documentation; l'ouvrage de DE L'EPINOIS (La question de Galilée, les faits et leurs conséquences, 1878) n'est pas cité une seule fois. L. G.

Covarrubias y Orozco, Sebastián de. Tesoro de la lengua castellana, o española. Madrid, 1611. Microphotographic reproduction from the copy in the library of the Hispanic Society of America. New York, Hispanic Society. 1927. ISIS

The original is a very bulky quarto volume; the facsimile is a small book of 155 pages, each containing the reproduction of nine pages of the original work. It must be read with a magnifying glass, e.g., with the Fiske reading machine (patented, Jan. 5, 1926). The author was born in Toledo and flourished in the first half of the seventeenth century; the Tesoro was dedicated to King PHILIP III. Don SEBASTIÁN was « capellan de su Magestad, mastre scuela y canonigo de la Santa Yglesia de Cuenca, y consultor del Santo Oficio de la Inquisicion ». G. S.

Gooch, G. P. English democratic ideas in the seventeenth century. 2nd edition with supplementary notes and appendices by H. J. LASKI. x+315 p. Cambridge, University Press, 1927. ISIS

Reviewed by RUDOLF METZ, *Deutsche Literaturzeitung*, 6, 1735-36, 1929.

Gouhier, Henri. Sur la date de la Recherche de la vérité, de DESCARTES. *Rev. d'histoire de la philosophie*, 3, 296-320, 1929. ISIS

Harrison, G. B. The trial of the Lancaster witches, A.D. MDCXII. Edited with an introduction by G. B. HARRISON. XLVII+188 p. London, DAVIES, 1929. ISIS

Reviewed in *Nature*, 124, 678-80, 1929.

XVIIth Century (second half)

A. — *Mathematics*

Cajori, Florian. A forerunner of MASCHERONI. *American Mathematical Monthly*, 36, 364-69, 1929. ISIS

Apropos of GEORG MOHR's Euclides danicus (Amsterdam, 1672).

Cajori, Florian. The translator of NEWTON's System of the world. *Nature*, 124, 513, 1929. ISIS

This translator was ANDREW MOTTE.

Cajori, Florian. Sir ISAAC NEWTON's edition of VAREN's geography. *Math. Gazette*, 415-16, 1929. ISIS

Dijksterhuis, E. J. De ontdekking van het tautochronisme der cycloidale valbeweging. *Euclides*, 5, 35 p., facs., 1928-29. ISIS

Dijksterhuis, E. J. Over een mechanisch axioma in het werk van

CHRISTIAAN HUYGENS. *Christian Huygens, Tijdschtift*, 7, 161-80, 1929. ISIS

Kriloff, A. N. On a theorem of Sir ISAAC NEWTON. *Monthly Notices of the Royal Astron. Soc.*, 84, 392-95, 1923-24. ISIS

« For the determination of parabolic orbits of comets, the well-known relation between the time of description of an arc of the orbit, the two radii vectores drawn to the extremities of this arc, and the chord is of fundamental importance. This relation is called in all modern treatises on theoretical astronomy, even in English ones, LAMBERT's or EULER-LAMBERT's theorem, although LAGRANGE in his *Mécanique Analytique* pointed out that it is only the analytical expression of the Xth Lemma in Book III. of NEWTON's *Principia*. »

Kriloff, A. N. On Sir ISAAC NEWTON's method of determining the parabolic orbit of a comet. *Monthly Notices of the Royal Astronom. Soc.*, 85, 640-56, 1924-25. ISIS

« Sir ISAAC NEWTON's method of determining the parabolic orbit of a comet is explained in Proposition XLI. of the third book of the *Principia* and in the Lemmas VII.-XI. preceding this proposition. Although this method forms one of the most admirable achievements of NEWTON, it does not now receive the attention it deserves, and is scarcely ever mentioned in modern treatises on theoretical astronomy. The aim of this paper is to call the attention of students of astronomy to these wonderful pages of the *Principia*, and to show that they are as perfect as anything else he ever wrote. »

Loria, Gino. Una curva speciale ideata da VINCENZO VIVIANI. *Bollettino di Matematica*, 8, XLIX-LI, 1929. ISIS

Sampson, Ralph Allen. On editing NEWTON. *Monthly Notices of the Royal Astron. Soc.*, 84, 378-83, 1923-24. ISIS

B. — *Physical Sciences and Technology*

Emanuelli, Pio. La rotazione della terra e le esperienze dell'Accademia del Cimento. *Archeion*, 11, 210-15, 1929. ISIS

L'expérience fameuse de FOUCAULT prouvant la rotation de la terre avait été faite à Florence, dès 1661 environ, par VICENZO VIVIANI (1622-1703), mais sans qu'on se rendit compte que la variation du plan d'oscillation du pendule était causée par la rotation de la terre. L. G.

Spriggs, G. W. The honourable ROBERT BOYLE: a chapter in the philosophy of science. *Archeion*, 11, 1-12, 1929. ISIS

BOYLE n'est plus guère connu que par la loi qui porte son nom; il mérite mieux. L'auteur examine en particulier sa théorie de la nature des qualités des corps. L. G.

C. — *Natural Sciences*

Dorveaux, Paul. Les grands pharmaciens apothicaires membres de l'Académie royale des sciences. I. CLAUDE BOURDELIN. *Bul. de la soc. d'hist. de la pharmacie*, 17e année, 289-97, 1929. ISIS

CLAUDE BOURDELIN (1621-1669), membre de l'académie royale des sciences, à la fondation de cette compagnie par COLBERT en 1666; étude des eaux minérales; analyse chimique de nombreux végétaux. L. G.

Dorveaux, Paul. Les grands pharmaciens apothicaires membres de l'Académie royale des sciences. II. MOYSE CHARAS. *Bul. de la soc. d'histoire de la pharmacie*, 17e année, 329-40, 377-90, 1929. ISIS

MOYSE CHARAS (Uzès, 1619,04,02 — Paris, 1698,01,17). Apothicaire à Orange, puis à Paris, démonstrateur en chimie au Jardin royal des plantes (1671-80), apothicaire du roi d'Angleterre CHARLES II (1680-83?) — pendant son séjour à Londres, il se fait recevoir docteur en médecine —; médecin en Hollande en 1683, en Espagne de 1683 à 89 — il y fut incarcéré dans les prisons de l'Inquisition — puis de nouveau à Paris. Auteur, parmi d'autres ouvrages, de : Traité de la chymie, 1663, publié sous le nom de CHRISTOFLE GLASER; Thériaque d'Andromachus, 1668; Nouvelles expériences sur la vipère, 1670; Pharmacopée royale galénique et chymique, 1676. L. G.

Ziino, Michele. Malpighiana. *Archeion*, 11, 55-63, 1929. ISIS

A l'occasion du centenaire de MALPIGHI, l'auteur donne une bibliographie de travaux parus sur MALPIGHI, et étudie ses relations avec ANTONIO RUFFO, un peintre de Messine, puis avec les peintres de l'école bolonaise. L. G.

D. — *Medical Sciences*

Castiglioni, Arturo. BERNARDO RAMAZZINI a Padova. Discorso tenuto il 26 ottobre 1927 al Congresso di Medicina del Lavoro in Carpi. 13 p. Milano, VALLARDI, 1928. ISIS

Goulard, Roger. Quelques maîtres-chirurgiens briards. *Bulletin de la société française d'histoire de la médecine*, 23, 315-24, 1929. ISIS

Hellinga, G. Een en ander over de overeenkomsten, aangegaan gedurende het tijdvak 1651-1699 tusschen regenten van het Amsterdamsche St. Pieters Gast- en Pesthuis en cureerders. *Bijdragen tot de geschiedenis der geneeskunde*, 9, 201-06, 1929. ISIS

Torkomian, V. Quelques mots sur l'origine de GEORGES BAGLIVI. *Bulletin de la société française d'histoire de la médecine*, 23, 306-08, 1929. ISIS

GIORGIO BAGLIVI, né à Raguse en 1668, mort en 1708; était d'origine arménienne.

E. — *Alia*

(**Digby, Kenelm**). KENELM DIGBY Papers. According to a note, signed R. F., in the *British Museum Quarterly* (vol. 4, 82, 1929), that Museum has recently acquired together with the MIDDLETON Papers some forty documents concerning Sir KENELM DIGBY (1603-65) mostly in his own writing. « These documents are very various in character, comprising literary criticisms, letters (to Sir TOBIE MATTHEW and others), drafts of a speech in Parliament in his own defence, theological and philosophical disquisitions, euphuistic rhapsodies on the beautiful ladies taking the waters at Spa, declamations in Italian before learned societies, notes on alchemical recipes, and other miscellaneous matter. » G. S. ISIS

(**Spinoza**). The correspondence of SPINOZA. Translated and edited with introduction and annotations by A. WOLF. 502 p. London, ALLEN and UNWIN, 1928. ISIS

Reviewed by E. N. DA C. ANDRADE, *Nature*, 124, 787-88, 1929.

(**Walton, Izaak**). The compleat WALTON. The compleat angler. The lives of DONNE, WOTTON, HOOKER, HERBERT, and SANDERSON. With Love and Truth and Miscellaneous Writings. Edited by GEOFFREY KEYNES. Illustrations by THOMAS POULTON and CHARLES SIGRIST. x+631 p. London, Nonesuch Press, 1929. ISIS

XVIIIth Century (whole and first half)

B. — *Physical Sciences and Technology*

Metzger, Hélène. NEWTON : la théorie de l'émission de la lumière et la doctrine chimique au XVIII^e siècle. *Archeion*, 11, 13-25, 1929. ISIS

La lumière, dans la théorie de l'émission, étant de nature corporelle, participe à toutes les qualités de la matière; elle peut donc se changer en corps, et un corps peut se changer en lumière; et alors, qu'est-ce qu'un corps combustible, sinon une combinaison de la substance même de la lumière avec le corps calciné, cette lumière emprisonnée dans le combustible ayant, de plus, tendance à attirer la lumière extérieure; et c'est pourquoi pour BUFFON, le diamant, très réfringent, est combustible. Les chimistes étaient donc tentés d'identifier la matière de la lumière newtonienne avec le phlogistique stahlien. Les travaux de LAVOISIER devaient faire crouler la théorie de l'émission et redonner vigueur à l'optique ondulatoire. L. G.

Metzger, Hélène. NEWTON et l'exposé de la doctrine chimique au XVIII^e siècle. *Archeion*, 11, 190-97, 1929. ISIS

C. — *Natural Sciences*

Zaunick, Rudolph. Ein kleiner Beitrag zur Geschichte der Urzeugung. *Zoologische Annalen*, 7, 95-6, 1915. ISIS

Apropos of VALENTINUS KRÄUTERMANN, i.e., L. CHRISTOPH VON HELLWIG (1663-1721): Der curieuse und vernünftige Zauber-Artzt (Frankfurt, 1725).

D. — *Medical Sciences*

Costa Santos, Sebastiao. Os mestres de anatomia e o ensino da cirurgia no Hospital real de todos os santos no século XVIII. *Arquivo de anatomia e antropologia*, 12, 195-311, 3 pl., 1928. ISIS

E. — *Alia*

Charles-Roux, Fr. Les échelles de Syrie et de Palestine au XVIII[e] S. 224 p., 27 pl. Paris, GEUTHNER, 1928. ISIS

Reviewed by M.GASTER, *Journal of the Royal Asiatic Society*, 903-04, 1929.

Metz, Rudolf. DAVID HUME, Leben und Philosophie. XII+405 p. port. Stuttgart, FROMMANN, 1929. ISIS

Reviewed by FERDINAND TÖNNIES in *Deutsche Literaturzeitung*, 6, 1951-54, 1929.

Stein, Robert. Berichtigung betreffs LESSINGS. *Archiv für Geschichte der Mathematik, der Naturwissenschaften und der Technik*, 12, 215-16, 1929. ISIS

XVIIIth Century (second half)

B. — *Physical Sciences and Technology*

Speter, Max. Nachtrag zur Geschichte des Gegenstrom-Kühlapparates. *Chem. Apparatus*, 16, 59-61, 174-76, 198-99, 9 fig., 1929. ISIS

Reviewed by DIERGART, *Mitteilungen zur Geschichte der Medizin und der Naturwissenschaften*, 29, 12, 1930.

Steavenson, W. H. Some eye-pieces made by Sir WILLIAM HERSCHEL. *Monthly Notices of the Royal Astron. Soc.*, 84, 607-10, 1 pl., 1923-24. ISIS

Vowles, Hugh P. Science and engineering. *Nature*, 124, 618, 1929. ISIS

Apropos of L. N. M. CARNOT's hydrodynamical principle.

Wohlbold, H. Führer durch GOETHES Sammlung optischer Apparate zugleich als Einführung in die Farbenlehre. Führer durch das GOETHE-Nationalmuseum in Weimar. Bd. 3. 103 S. Weimar, 1928. ISIS

C. — *Natural Sciences*

Cardini, Massimiliano. I primordi della biologia moderna : LAZZARO SPALLANZANI. *Scientia*, 45, 377-86, 1929 ; trad. française, *id.*, supplément, 142-50, 1929. ISIS

Cardini, Massimiliano. LAZZARO SPALLANZANI (1729, 01, 12 — 1799, 02, 12). *Riv. di storia d. sc. med. e natur.*, 20, 196-9, 1929. ISIS

D. — *Medical Sciences*

Barbillion. LA CONDAMINE et la variolisation. *Bulletin de la société française d'histoire de la médecine*, 23, 261-70, 1929. ISIS

Hale-White, Sir William. The WITHERING letters in the possession of the Royal Society of Medicine. *Proceedings of the Royal Society of Medicine* (Section of the history of medicine, 37-41) 22, p. 1087-91, London, 1929. ISIS

Some thirty letters by WILLIAM WITHERING (1741-1799), the physician who wrote on digitalis and its use in medicine, and some one hundred letters addressed to him, are now in the library of the Royal Society of Medicine, London. HALE-WHITE has examined them and in his paper he extracts some of the data found, which are largely biographical. A few facts, not previously known, about people who lived in the last half of the eighteenth century are disclosed. H. R. V.

Harris, Thomas Jefferson. The early history of the regulations governing the practice of medicine in the Province and State of New York. *Medical life*, 36, 521-25, 1929. ISIS

Limon, G. Un procès-verbal d'autopsie au XVIII[e] siècle. *Bulletin de la société française d'histoire de la médecine*, 23, 270-71, 1929. ISIS

McFarland, Joseph. The epidemic of yellow fever in Philadelphia in 1793 and its influence upon Dr. BENJAMIN RUSH. *Medical life*, 36, 449-96, 4 port., 1929. ISIS

Middleton, William S. PHILIP SYNG PHYSICK, father of American surgery. *Annals of medical history*, 1, 562-82, 1929. ISIS

Mirone, Giuseppe. FRANCESCO MARIA SCUDERI e la profilassi del vaiuolo. *Riv. di storia d. sc. med. e natur.* 20, 173-89, portr., 1929. ISIS

F. M. SCUDERI, médecin sicilien (1733-1819), professeur à l'université de Catania, précurseur de JENNER. L. G.

Rolleston, Sir Humphry. SAMUEL JOHNSON's medical experience. *Annals of medical history*, 1, 540-52, 1929. ISIS

Ruska, Julius. Aus JOHANN SAMUEL HALLES Gifthistorie, Berlin 1787. *Die Medizinische Welt*, Nr. 15, 9 S., 1928. ISIS

Waring, Joseph Ioor. An incident in early South Carolina medicine. *Annals of medical history*, 1, 608-10, 1929. ISIS

Weeks, Carnes. DAVID RAMSAY, physician, patriot and historian. *Annals of medical history*, 1, 600-07, 3 fig., 1929. ISIS

E. — *Alia*

Dehérain, Henri. La vie de PIERRE RUFFIN, orientaliste et diplomate (1742-1824). Deux volumes. Tome premier : une carte, 8 pl., VIII+292 p. (Haut-commissariat de la République française en Syrie et au Liban, Service des antiquités et des beaux-arts, Bibliothèque archéologique et historique, 13). Paris, GEUTHNER, 1929. ISIS

XIXth Century (whole and first half)

A. — *Mathematics*

Bjerknes, Carl Anton. NIELS HENRIK ABEL (1802-1829). Eine Schilderung seines Lebens und seiner Arbeit. Von C. A. BJERKNES (1825-1903). Umgearbeitete und gekürzte Ausgabe aus Anlass von ABELS 100-jährigem Todestag. Von VILHELM F. K. BJERKNES. Ins Deutsche übertragen von ELSE WEGENER-KÖPPEN. V+136 p., portrait. Berlin, SPRINGER, 1930. ISIS

C. A. BJERKNES's papers on ABEL, published in 1880, appeared in book form in 1884 or 1885. A. P.

Bolzano, Bernard. Wissenschaftslehre. In 4 Bänden. Neudruck, zweite verbesserte Auflage. Band 1. XVI+574 p. Leipzig, MEINER, 1929. ISIS

(Gauss, Carl Friedrich; Gerling, Christian Ludwig). Briefwechsel

zwischen CARL FRIEDRICH GAUSS und CHRISTIAN LUDWIG GERLING. Jubelband, der Philipps-Universität in Marburg zur Feier ihres vierhundertjährigen Bestehens gewidmet. Hrsg. von CLEMENS SCHAEFER. XX+820 p., 1 pl., 1 facs. (*Schriften d. Gesellsch. z. Beförderung der gesamten Naturwissensch. zu Marburg*. Hrsg. m. Unterstützung des Univ. bundes Marburg, Bd. 15). Berlin, ELSNER, 1927. ISIS

Reviewed by P. EPSTEIN, *Deutsche Literaturzeitung*, 6, 1691-95, 1929.

Korzybski, Alfred. ALEXANDER VASILIEVICH VASILIEV (1853-1929). *Science*, 70, 599. ISIS

Part of the material in this article is taken from a biography of Professor A. V. VASILIEV by his pupil, Professor N. N. PARFENTIEV.

Lorey, Wilhelm. NIELS HENRIK ABEL (1802-1829). Zur hundertsten Wiederkehr seines Todestages. *Journal für die reine und angewandte Mathematik*, 161, 65-72, 1929. ISIS

Petronievics, B. N. LOBATCHEWSKY et J. BOLYAI. Étude comparative d'un cas spécial d'inventeurs simultanés. *Revue philosophique*, 54, 190-214, 1929. ISIS

Cette étude se rattache à la même idée générale que celle publiée ici par PETRONIEVICS sur DARWIN et WALLACE (*Isis*, 7, 25-57, 1925). Le cas LOBATCHEWSKY-BOLYAI est plus typique encore que celui de DARWIN et WALLACE, parce que l'invention de la géométrie non-euclidienne était vraiment une idée révolutionnaire, et parce que les deux auteurs ne se sont jamais connus : LOBATCHEWSKY n'a même jamais appris l'existence de BOLYAI.
L. G.

Vetter, Quido. KAREL BEDRICH GAUSS a jeho rodina. *Ceské Revue*, no. 6, 7 p., 1928-29. ISIS

B. — *Physical Sciences and Technology*

Gauss, Carl Friedrich. CARL FRIEDRICH GAUSS' Werke. Hrsg. von d. Gesellsch. d. Wissensch. zu Göttingen. Bd. 11. 2 Abt. : Magnetismus, Elektrodynamik, Optik, hrg. von CLEMENS SCHAEFER. 217 p., 11 fig. Berlin, SPRINGER, 1929. ISIS

Reviewed by A. KOPFF, *Deutsche Literaturzeitung*, 6, 1885-86, 1929.

Davies, C. D. P. HERSCHEL'S 18 $^3/_4$ in. speculum (the « 20 ft. »). *Monthly Notices of the Royal Astron. Soc.*, 84, 23-26, 1923-24. ISIS

Lippmann, Edmund O. von. Vor hundert Jahren IX. *Die Deutsche Zuckerindustrie*, Nr. 1, 20-1, 1930. ISIS

Robinson, Herbert Spencer. THOMAS YOUNG. Chronology and a bibliography with estimates of his work and character. *Medical life*, 36, 527-40, 2 ports., 1929. ISIS

Rohr, Moritz von. JOSEPH FRAUNHOFERS Leben, Leistungen und Wirksamkeit. XX+233 p. (Grosse Männer: Studien zur Biologie des Genies, herausgegeben von WILHELM OSTWALD, Band 10). Leipzig, Akademische Verlagsgesellschaft, 1929. ISIS

Stenger, E. Geschichte der Photographie. VI+44 S., 10 Abb., 5 Bildnissen. (*Deutsches Museum, Abhandlungen und Berichte*, Heft 6). Berlin, VDI-Verlag, 1929 (RM. 1). ISIS

Ausgehend von den ersten Lichtkopien JOHANN HEINRICH SCHULZES und den Lithographien SENEFELDERS wird der Leser in gerader Linie und in leichtverständlicher Form bis zu den neuzeitlichen Erfindungen geführt. Die Entwicklung der photographischen Kamera, der Negativ- und Kopierschichten wird geschildert. Die Anwendungen der Photographie werden auf etwa 40 Gebieten bis in ihre frühesten Anfänge zurückverfolgt, wobei der Verfasser mancherlei bisher noch unbekannte Quellen erschliesst. Auch sind die ersten Lehrbücher, Zeitschriften, Lehreanstalten, Ausstellungen und Kongresse beschrieben. In einem besonderen Abschnitt sind Urteile bedeutender Männer über die Photographie aus der Zeit ihrer Anfänge in interessanter Weise zusammengestellt. Literaturverzeichnis. Namen- und Sachverzeichnis.

Young, Thomas. Program of the THOMAS YOUNG memorial meeting of the Optical Society of America. Cornell University, Ithaca, N. Y., October 24 to 26, 1929. Supplt. to *Journal of the Optical Society of America*, vol. 19, no. 4, 21 p., portrait, 1929. ISIS

Lectures by H. B. WILLIAMS, SELIG HECHT, HENRY CREW. G. S.

C. — *Natural Sciences*

Ami, Henry M. Graptolite centenary, 1829-1929. *Nature*, 124, 766-7, 1929. ISIS

« It was in 1829 that ADOLPHE BRONGNIART first described ' graptolites ', two of them, and both from the black carbonaceous shales of the Point Levis cliffs opposite the city of Quebec, Canada. BRONGNIART was a botanist, and although graptolites are marine animals of the hydroid type, these two forms went the rounds of the different museums of natural history in the Jardin des Plantes, Paris, and at last were described in the Prodrome for 1829 as plants. Plants they do certainly appear to resemble, giving leaf-like expansions, venations, moss-like characters, etc., all of which led early palaeontologists to ascribe generic and specific names to the graptolites they described — *Phyllograptus angustifolius, Dipl. folium, Tetragr. bryonoides*, etc. »

Berthelot, René. LAMARCK et GOETHE : l'évolutionnisme de la continuité au début du XIX^e siècle. *Rev. de métaphysique et de morale*, 36, 285-341, 1929. ISIS

Muschamp, Edward A. Audacious AUDUBON. The story of a great pioneer, artist, naturalist, and man. 312 p., 5 ill. New York, BRENTANO, 1929. ISIS

Biography of the artist-naturalist, JOHN JAMES AUDUBON (1785-1851). Pleasantly written but derived from the earlier works by Mrs. AUDUBON, MARION R. AUDUBON and ELLIOTT COUES, FRANCIS HOBART HERRICK, etc. G. S.

D. — *Medical Sciences*

Bonnet-Roy, Fl. Un fils de Madame TALLIEN : le Dr. CABARRUS. *Bulletin de la société française d'histoire de la médecine*, 23, 279-300, pl., 1929. ISIS

Ghinopoulo, Sophocle. Représentants de l'école de médecine de Vienne émigrés en France au XIX^e siècle. *Bulletin de la société française d'histoire de la médecine*, 23, 237-60, 1929. ISIS

Haberling, William. From the life of JACOB HENLE. *Medical life*, 36, 501-07, 1929. ISIS

With five portraits of HENLE.

Herczeg, Arpad. Le mérite et la priorité de ROBERT REMAK au sujet de la découverte du champignon favique. *Bulletin de la société française d'histoire de la médecine*, 23, 301-05, 1929. ISIS

Harting, Johannes. MAX JACOBI, ein deutscher Arzt (1775-1858). Ein Lebensbild nach Briefen und anderen Quellen. 240 p., Cörlitz, STARKE, 1929. ISIS

Krumbhaar, Edward B. The early days of the American Journal of the Medical Sciences. *Medical life*, 36, 587-606, 8 portr., 2 pl., 1929. ISIS

Noorden, Werner von. Der Kliniker CHRISTIAN FRIEDRICH NASSE (1778-1851). 99 p., 3 pl. (*Arbeit. z. Kenntnis d. Gesch. d. Med. im Rheinland und in Westfalen.* H. 3.) Jena, FISCHER, 1929. ISIS

Pool, Eugene H.; McGowan, Frank J. Surgery at the New York

hospital one hundred years ago. *Annals of medical history*, 1, 489-539, 24 fig., 1929. ISIS

Robinson, Victor. The early medical journals of America founded during the quarter-century 1797-1822. *Medical life*, 36, 553-85, 7 port., facs., 1929. ISIS

Includes a facsimile of EPHRAIM MCDOWELL's original article on ovariotomy, published in the *Eclectic Repertory and Analytical Review*, 7, 242-43-44, 1817.

Robinson, Victor. JOHANNES EVANGELISTA PURKINJE. *Scientific Monthly*, 29, 217-29, 3 fig., 1929. ISIS

Weinberger, Bernhard Wolf. JOHN HARRIS (1798-1849) the father of American dental education : his true place in American dentistry. *Dental Cosmos*, p. 3-8, November 1929. ISIS

E. — *Alia*

Mauduit, Roger. AUGUSTE COMTE et la science économique. 292 p. (*Biblioth. de philosophie contemporaine*). Paris, F. ALCAN, 1929 (30 fr.). ISIS

« Il y a cent ans, AUGUSTE COMTE condamnait l'individualisme économique né de la Révolution, ainsi que la science des richesses elle-même, qui proclamait l'excellence de l'ordre spontané des sociétés et affirmait que le meilleur gouvernement est celui qui ne gouverne pas. Alors que beaucoup d'écrivains de la génération réclamaient telles ou telles réformes matérielles pour sortir de la situation chaotique où se trouvait notre industrie en transformation, et établir plus de justice dans les relations humaines, AUGUSTE COMTE voulut trouver un remède moral aux malaises de la société et uniformiser pensées et sentiments par une philosophie et une religion acceptées par tous. C'est ainsi qu'il combattit le libéralisme — qui lui paraissait anarchique — de la science des richesses, et qu'il attaqua cette science économique dans sa partie la plus vulnérable, c'est à dire dans sa méthode.

« D'après la philosophie positive, seule une science sociale d'observation, embrassant la totalité des faits humains, est valable; et l'économie politique qui ne considère dans l'homme que l'aspect consommateur-producteur, mettant de côté délibérément les motifs religieux, altruistes, artistiques, et les sentiments du groupe, mutile la réalité qu'elle prétend étudier et se voue à une connaissance vague et hypothétique. D'avance AUGUSTE COMTE avait aperçu clairement que dans la suite, l'économie politique ainsi constituée ne pouvait être qu'une œuvre approximative et conjecturale. »

Schuster, Julius. ALEXANDER VON HUMBOLDTS geistige Art und Arbeit. Gedenkrede zum 70. Todestage am 6. Mai 1929. *Archiv für Geschichte der Mathematik, des Naturwissenschaften, und der Technik*, 12, 213-15, 1929. ISIS

Uta, Michel. La théorie du savoir dans la philosophie d'AUGUSTE COMTE ; préface de EDMOND GOBLOT. XX+288 p., F. ALCAN, Paris, 1929 (30 fr.). ISIS

Le premier chapitre (58 p.) de la thèse de MICHEL UTA est intéressant au point de vue particulier de l'histoire de la philosophie. L'auteur cherchant les origines de la philosophie d'AUGUSTE COMTE, les trouve dans le mouvement scientifico-philosophique du XVIII[e] siècle, spécialement chez D'ALEMBERT [loi des trois états, classification hiérarchique des sciences du général au spécial et du simple au composé, la philosophie conçue comme synthèse de toutes les sciences, importance de l'idée de progrès (CONCORDET)], et chez SAINT-SIMON, mais sans aller, comme l'avait fait DURKHEIM, jusqu'à lui attribuer l'honneur qu'on fait généralement à COMTE : UTA doute « de l'apport de la pensée de SAINT-SIMON dans la réalisation du positivisme comme philosophie spéculative », mais lui accorde « dans une certaine mesure, des droits réels sur les idées politiques qu'AUGUSTE COMTE développe au commencement et à la fin de sa carrière philosophique ». Le reste de l'ouvrage est ainsi partagé : a) la connaissance positive (59-131); b) la coordination des connaissances ; c) la conception sociologique de la connaissance. L. G.

XIXth Century (second half)

A. — *Mathematics*

Dedekind, J. W. R. (1831-1916). Essenza e significato dei numeri. Continuità e numeri irrazionali. Traduzione dal tedesco e note storico-critiche di OSCAR ZÀRISKI. Rome, STOCK, 1926. ISIS

Reviewed by A. NATUCCI, *Bollettino di Matematica*, 8, LXXXIX-XCI, 1929.

Fubini, Guido. LUIGI BIANCHI (1856-1928) e la sua opera scientifica. *Annali di matematica pura ed applicata*, 6, 45-83, 1929. ISIS

The last chapter, Le ricerche di carattere algebrico ed aritmetico, p. 81-83, is by A. M. BEDARIDA.

Lie, Sophus. Gesammelte Abhandlungen. 6. Bd. : Abhandlungen über die Theorie der Transformationsgruppen. 2. Abtlg. Hrsg. v. FRIEDRICH ENGEL. XXIV+940 p. Leipzig, TEUBNER, 1927. ISIS

Reviewed by GERHARD KOWALEWSKI, *Deutsche Literaturzeitung*, 6, 2319-20, 1929.

(Tannery, Paul). *Archeion*, 11, LXXV-CVIII, 1929. ISIS

La dernière séance du premier Congrès international d'Histoire des sciences (Paris, 20-24 mai 29) était consacrée à la mémoire de PAUL TANNERY. En plus d'adresses nombreuses et du discours de GINO LORIA, qui présidait le Congrès, il y a lieu de signaler les indications données au nom de DIÈS sur l'esprit dans lequel a été conçue la nouvelle édition préparée par ses soins de « La science hellène », depuis longtemps épuisée, et le discours

prononcé par L. BLONDEAUX sur la carrière d'ingénieur de PAUL TANNERY. L. G.

B. — *Physical Sciences and Technology*

Bloch, M. A. M. BUTLEROW, Leben und Schaffen. *Archiv für Geschichte der Mathematik, der Naturwissenschaften und der Technik*, 12, 121-45, 1 fig., 1929. ISIS

Chwolson, O. D. Die Evolution des Geistes der Physik 1873-1923. Aus dem Russischen übersetzt von V. R. BURSIAN. 197 p. Braunschweig, VIEWEG, 1927. ISIS

Reviewed by G. MIE, *Deutsche Literaturzeitung*, 6, 2122-30, 1929.

Duhem, Pierre. PIERRE DUHEM, son œuvre scientifique. *Mém. de la Soc. des Sciences phys. et nat. de Bordeaux*, 1, port., 1927. ISIS

Leonard, Jonathan Norton. Loki: the life of CHARLES PROTEUS STEINMETZ. New York, Doubleday, 1929. ISIS

Lippmann, Edmund O. von. Ein Beitrag zur Geschichte der Saftreinigung. *Die Deutsche Zuckerindustrie*, Berlin, 1929, Nr. 43. ISIS

Skowronnek, Karl. Der Erfinder der elektrischen Glühlampe — ein Deutscher. *Archiv für Geschichte der Mathematik, der Naturwissenschaften, und der Technik*, 12, 210-12, 3 fig., 1929. ISIS

Apropos of HEINRICH GÖBEL (1818-1893).

Swan, M. E. and K. R. Sir JOSEPH WILSON SWAN. A memoir. 183 p., 6 pl. London, BENN, 1929. ISIS

Reviewed by A. R., *Nature*, 124, 567-69, 1929.

Walker, Sir James. SVANTE ARRHENIUS. *Annual report of the Smithsonian Institution for* 1928, p. 715-35, 1 pl., Washington, 1929. ISIS

ARRHENIUS memorial lecture, delivered on May 10, 1928. Reprinted by permission from the *Journal of the Chemical Society*, 1928, London.

C. — *Natural Sciences*

Campbell, R. J. LIVINGSTONE. A new biography. 370 p. London, BENN, 1929. ISIS

Gudger, E. W. NICOLAS PIKE (1818-1905) and his unpublished paintings of the fishes of Mauritius, western Indian Ocean, with an index

to the fishes. *Bulletin of the American Museum of Natural History*, 58, 489-530, 8 fig., 1929. ISIS

Jones, Leonard Chester. ARNOLD HENRY GUYOT. Faculty papers of Union College, *Union College Bulletin*, vol. 23, no. 2, p. 31-65. Albany, N. Y., 1930. ISIS

See account of the author's longer paper on same subject (Neûchatel, 1929). G. S.

Jones, Leonard Chester. ARNOLD GUYOT et Princeton. 125 p. (*Recueil de Travaux publiés par la Faculté des Lettres sous les auspices de la Société académique*, 14). Neuchâtel, Secrétariat de l'Université, 1929 (6 Swiss frs.). ISIS

ARNOLD HENRY GUYOT (1807-1884), born near Neuchâtel, was one of that little band of Swiss scientists who did so much for the sound development of American science. Two others were LOUIS AGASSIZ and F. R. HASSLER (*Isis*, 13, 119). GUYOT came to America in 1848 at the instance of his friend, AGASSIZ; was professor of physical geography and geology in Princeton from 1854 to his death; he was also one of the founders of American meteorology. JONES's memoir is a valuable contribution to GUYOT's biography. For example, it contains abundant quotations from his letters. It helps us to realize that he was not only a great scientist but also a great man. A bibliography of his writings has been added, but we miss a portrait;—when reading of a man's life and achievements it is pleasant to see his face. G. S.

Klunzinger, Carl Benjamin (1834-1914). Erinnerungen aus meinem Leben als Naturforscher und Arzt zu Koseir am Roten Meere. *Zoologische Annalen*, 6, 223-311, 1914. ISIS

D. — *Medical Sciences*

Delprat, C. C. Nadere bijdrage tot de geschiedenis van het Tijdschrift der maatschappij (Maandblad) 1850-1856. *Bijdragen tot de geschiedenis der geneeskunde*, 9, 265-88, 1929. ISIS

Diepgen, P. EMIL NOEGGERATH, for the hundredth anniversary of his birthday on October 5th, nineteen hundred and twenty seven. 7 p. Anvers, De Vlijt, 1929. ISIS

Feigenbaum, Aryeh. ALBRECHT VON GRAEFE (1828-70). *Medical life*, 36, 541-47, 1929. ISIS

Garrison, F. H. RAMON Y CAJAL. *Bull. New York Acad. Med.* 2. series, 5, 483-508, 1929. ISIS

Müller, Reiner. 80 Jahre Seuchenbakteriologie. Die Seuchenbakteriologen vor ROBERT KOCH : POLLENDER 1849, BRAUELL 1856, DELAFOND 1856, DAVAINE 1863. Ein 50-Jahr-Gedenken des Milzbrandforschers POLLENDER. *Zentralblatt f. Bakteriologie, Parasitenkunde u. Infektionskrankheiten.* I. Abteilung. Originale, Bd. 115, 17 p., 1 pl. Jena, FISCHER, 1929. ISIS

Pleadwell, Frank Lester. NINIAN PINKNEY, M. D. (1811-1877), surgeon, United States Navy. *Annals of medical history*, 1, 666-97, 1 fig., 1929. ISIS

Rolleston, Sir Humphry Davy. The right honourable Sir THOMAS CLIFFORD ALLBUTT (1836-1925). A memoir. VII+314 p., 3 pl. London, MACMILLAN, 1929. ISIS

Reviewed in *Nature*, 124, 833-34, 1929.

Ross, Sir Ronald. Letters from Rome on certain discoveries connected with malaria by T. EDMONSTON CHARLES ; and addenda, consisting of an article by S. CALANDRUCCIO, letters from ROBERT KOCH and A. LAVERAN, and a statement by Lord LISTER. Edited, with a preface and remarks, by Sir RONALD ROSS. 78 p. London, Ross Institute and Hospital for Tropical Diseases, 1929. ISIS

Serrano, José Antonio. Cartas de JOSÉ ANTONIO SERRANO em sua juventude a uma senhora. (Edited by VIRGINIA SANTOS). *Arquivo de anatomia e antropologia*, 12, 313-50, 1928. ISIS

Serrano, José Antonio. Mais algumas cartas de JOSÉ ANTONIO SERRANO. (Edited by BARBOSA SOEIRO). *Arquivo de anatomia e antropologia*, 12, 350-58, 1928. ISIS

Taylor, J. Madison. Personal glimpses of S. WEIR MITCHELL. Incidents in the life of the physician, scientist, novelist and poet narrated by his associate and assistant. *Annals of medical history*, 1, 583-98, 1929. ISIS

Torkomian, V. Un vénérologue arménien au XIX^{e} siècle. *Bulletin de la société française d'histoire de la médecine*, 8, 309-15, 1929. ISIS

JOSEPH BEYRAN MELCONIAN (Docteur Beyran), né à Andrinople, 1825, mort à Paris en 1866.

E. — *Alia*

Battistini, M. Le relazioni di ADOLFO QUETELET con i dotti ita-

liani. *Riv. di storia d. sc. med. e naturali*, 20, 115-27, 1929. ISIS

(**Bury, J. B.**) A bibliography of the works of J. B. BURY. Compiled with a memoir by NORMAN H. BAYNES. 184 p. Cambridge University Press, 1929. ISIS

Howe, M. A. DeWolfe. JAMES FORD RHODES : American historian. 376 p. New York, APPLETON, 1929. ISIS

Reviewed by DIXON RYAN FOX, *American Historical Review*, 35, 141-43, 1929.

XXth Century

B. — *Physical Sciences and Technology*

Baxter, Gregory P. THEODORE WILLIAM RICHARDS. *Annual report of the Smithsonian Institution* for 1928, p. 737-47, 1 pl., Washington, 1929. ISIS

Reprinted by permission from *Science*, 68, no. 1763, Oct. 12, 1928.

Desgrez, A. CHARLES MOUREU (1863-1929). *Revue scientif.*, 674-8, 1929. ISIS

London, Science Museum. South Kensington. Handbook of the collections illustrating aeronautics. Heavier-than-air craft. London, H. M. Stationery Office, 1929. ISIS

Rutherford, Sir Ernest. Recent reactions between theory and experiment. The Raman effect : the constitution of hydrogen gas. *Nature*, 124, 878-80, 1929. ISIS

From the presidential address delivered at the anniversary meeting of the Royal Society on Nov. 30.

C. — *Natural Sciences*

Joerg, W. L. G. Brief history of polar exploration since the introduction of flying. To accompany a physical map of the Arctic and a bathymetric map of the Antarctic. 49 p., 8 fig. (American Geographical Society, special publication no. 11). New York, American Geographical Society, 1930. ISIS

Rübel, E. Bericht über das Geobotanische Foschungsinstitut Rübel Zürich 1918-1928. 56 p., 2 pl. Zürich, Zürichbergstrasse 38, 1929. ISIS

PART II

HISTORICAL CLASSIFICATION

Including only the items which could not be included in Part I — the fundamental (centurial) classification. Hence a student of Muslim science, for example, should not peruse simply the notes collected below under the heading « Islam », he should examine as well those included above under the headings VIIth century, VIIIth century, etc.

CONTENTS :

I. — *Antiquity* : 1. Antiquity (generalities); 2. Egypt; 3. Babylonia; and Assyria ; 4. Greece ; 5. Rome.
II. — *Middle Ages* : 6. Middle Ages (generalities) ; 7. Byzantium.
III. — *Oriental Science and Civilization* : 8. Asia (generalities ; Western Asia ; Central Asia ; Eastern Asia) ; 9. India ; 10. China ; 11. Japan ; 12. Israel ; 13. Iran ; 14. Islam.

I. ANTIQUITY

1. — ANTIQUITY (*generalities*).

Archibald, Raymond Clare. Mathematics before the Greeks. *Science*, 71, 109-21, 1930. ISIS

« Our conceptions of Egyptian and Babylonian mathematics have been notably changed during the past fifteen years so that the third edition of the first volume of CANTOR's great history is already quite out of date. Even since last March much of great interest to the student has been published. Hence it seemed both appropriate and timely for me to endeavor to present to you an accurate even though fragmentary survey of present knowledge of the mathematics of Egyptians and Babylonians, for it is to theirs alone that I shall refer in considering mathematics before the Greeks, that is before 600 B. C. Indeed, practically all the mathematics which I shall consider was in use before 1600 B.C. » Address of the retiring vice-president and chairman of Section A—Mathematics, of the Amer. Assoc. for the Advancement of Science, delivered at Des Moines, Iowa, December 30, 1929. There are 79 footnotes. A more elaborate survey of the literature from 1706 to 1930 on Egyptian and Babylonian mathematics, with exhaustive indexes, will be found in ARCHIBALD's « Bibliography », in the CHACE-BULL-MANNING edition of the Rhind Mathematical Papyrus (*Isis*, 14, 251-55). A. P.

British Museum. A guide to the exhibition illustrating Greek and Roman life. Third edition. VIII+238 p. (Department of Greek and Roman Antiquities). London, British Museum, 1929. ISIS

Cary, M. The Greeks and ancient trade with the Atlantic. *Journal of Hellenic Studies*, 44, 166-79, 1924. ISIS

« The overland trade of the Mediterranean peoples with the Atlantic regions did not pass through the Greek ports of the southern French coast until a comparatively late age. The tin traffic through Massilia in particular can only be traced in the last three centuries B.C. Greek merchants during these centuries penetrated more than half-way through France, but did not reach the Atlantic seaboard. The sea route to the centres of Atlantic trade was probably discovered by a Phocaean captain in the sixth century B.C., and was certainly explored by the Massiliote PYTHEAS in the fourth century. After the fall of Carthage this route was opened up by Italian navigators, most of whom probably were Italiote Greeks, and it is likely that these participated in the overseas traffic to the Atlantic so long as this traffic lasted. »

Fotheringham, J. K. The probable error of a water-clock. *The Classical Review*, 29, 236-38, 1915. ISIS

« The probable error discovered on the adopted theory is equivalent to a probable error of twelve minutes per hour, so that the probable error of a clock time two hours from comparison with observed time would be twenty-four minutes. It makes no difference whether this is expressed in « seasonal » or in equinoctial time, such as we use. The probable rate of error is twelve seasonal minutes in a seasonal hour, twelve equinoctial minutes in an equinoctial hour ». A seasonal hour « comprises one-twelfth of the interval from sunset to sunrise for the particular night, and it is well known that the ancient water-clocks were constructed so as to indicate such hours. Each hour is divided into three parts, and the time is given », in the *Almagest*, « to the nearest third of an hour ». A. P.

Fotheringham, John Knight. A solution of ancient eclipses of the sun. *Monthly notices of the Royal Astronom. Soc.*, 81, 104-26, 1920-21. ISIS

Fotheringham, John Knight. Note on the secular accelerations of the Sun and Moon as determined from the ancient lunar and solar eclipses, occultations, and equinox observations. *Monthly notices of the Royal Astronom. Soc.*, 80, 578-81, 1919-20. ISIS

Mühlestein, Hans. Die Kunst der Etrusker. 1. Die Ursprünge. 241 p., 250 fig. Berlin, Frankfurter Verlags-Anstalt, 1929. ISIS

Reviewed by A. MERLIN, *Journal des savants*, 417-19, 1929.

Mühlestein, Hans. Über die Herkunft der Etrusker. 81 p. Berlin, Frankfurter, 1929. ISIS

Reviewed by EVA FIESEL, *Deutsche Literaturzeitung*, 6, 2400-02, 1929.

Poulsen, Frederik. Katalog des Etruskischen Museums (Helbig

Museum) der Ny Carlsberg Glyptothek. XVIII+232 p., 16 fig. Kopenhagen, NIELSEN and LYDICHE, 1927. ISIS

Reviewed by A. MERLIN, *Journal des savants*, 416, 1929.

Poulsen, Frederik. Bildertafeln des Etruskischen Museums (Helbig-Museum) der Ny Carlsberg Glyptothek. 144 pl. Kopenhagen, BAGGES, 1928. ISIS

Reviewed by A. MERLIN, *Journal des savants*, 416, 1929.

Schönbauer, Ernst. Beiträge zur Geschichte des Bergbaurechtes 208 p. (*Münchener Beiträge zur Papyrusforschung und antiken Rechtsgeschichte*, XII). München, BECK, 1929. ISIS

Reviewed by MAURICE BESNIER, *Journal des savants*, 421-22, 1929.

Schulten, A. Fontes Hispaniae antiquae. Fasc. II : 500 a. de J. C. hasta CÉSAR. Edicion de A. SCHULTEN. X+205 p. Barcelona, 1925. ISIS

Reviewed by HEINRICH RENKEL, *Deutsche Literaturzeitung*, 6, 1726-27, 1929.

2. — EGYPT.

Crum, W. E. A Coptic dictionary. Part I. XII+88 p. Oxford, Clarendon, Press, 1929. ISIS

Reviewed by F. Ll. G., *Journal of the Royal Asiatic Society*, 885-87, 1929.

Dawson, Warren R. Egyptian medicine. *Nature*, 124, 776-77, 1929. ISIS

Paper read at a reception to the president, committee, and members of the Egypt Exploration Society, held at the Wellcome Historical Medical Museum, on Nov. 11.

Glanville, S. R. K. The mathematical leather roll in the British Museum. *Journal of Egyptian archaeology*, vol. 13, 232-39, 1927. ISIS

For a discussion of it see KURT VOGEL in *Archiv für Geschichte der Mathematik* (vol. 11, 386-407, 1927), or ARCHIBALD's Bibliography (supplement, 1929; see *Isis*, 14, 254).

Gunn, Battiscombe ; Peet, T. Eric. Four geometrical problems from the Moscow Mathematical Papyrus. *Journal of Egyptian archaeology*, 15, 167-185, 1929. ISIS

Kaufmann, Alfred. Ewiges Stromland. Land und Mensch in Ägypten. 2. Aufl. XXVIII+251 p., 132 fig., 8 maps. Stuttgart, STRECKER und SCHRÖDER, 1929. ISIS

Reviewed by A. SCHARFF, *Deutsche Literaturzeitung*, 6, 1979, 1929.

Keimer, Ludwig. Nouvelles recherches au sujet du Potamogeton lucens L. dans l'Egypte ancienne. *Revue de l'Egypte anc.*, 2, 210-53, pl. XI-XV, 1929. ISIS

Reviewed by M. MEYERHOF, *Mitteilungen zur Geschichte der Medizin und der Naturwissenschaften*, 29, 20, 1930.

Keimer, Ludwig. Sur quelques petits fruits en faïence émaillée datant du moyen empire. *Bull. de l'Inst. franç. d'Archéol. Orientale*, 28, 49-96, 8 pl., 1929. ISIS

Reviewed by M. MEYERHOF, *Mitteilungen zur Geschichte der Medizin und der Naturwissenschaften*, 29, 20, 1930.

Lange, H. O. Husten und Heiserkeit in der ägyptischen Medizin. *Orientalistische Literaturzeitung*, 32, 725, 1929. ISIS

Lansing, Ambrose. An exhibition of copies of Egyptian wall paintings from tombs and palaces of the XVIII and XIX dynasties, 1600-1200 B.C. VII+52 p. New York, The Metropolitan Museum of Art, 1930. ISIS

Paintings by NORMAN and NINA DE GARIS DAVIES and assistants, some of which are already known through the sumptuous volumes of the Tytus Memorial Series. They illustrate admirably the development of Egyptian art from the XVIth to the XIIIth centuries. G. S.

Lefebvre, Gustave. Histoire des grands prêtres d'Amon de Karnak jusqu'à la XXI^e^ dynastie. 303 p., 5 pl. Paris, GEUTHNER, 1929 (150 frs.). ISIS

« Étudier la constitution du clergé amonien depuis le Moyen Empire, établir, des origines à la XXI^e^ dynastie, la succession historique des chefs du sacerdoce d'Amon de Karnak, décrire le rôle politique et religieux de ces derniers, déterminer le caractère de leurs rapports avec les souverains de l'Égypte, et montrer ce que fut et comment évolua, dans des circonstances données, une des phases de l'éternel conflit du pouvoir spirituel et du pouvoir temporel, tel est l'objet de cette monographie. » Ce travail permet de mesurer le progrès rapide de l'égyptologie; il suffit de le comparer à la thèse de WRESZINSKI : Die Hohenpriester des Amon (1904). Nos connaissances se sont considérablement étendues et précisées. Le présent mémoire est divisé en deux parties : l'histoire et la liste proprement dite. Celle ci énumère 31 grands prêtres et donne pour chacun d'eux toutes les sources littéraires et monumentales, les noms et titres en hiéroglyphes et en transcription, etc. L'auteur, ex-conservateur du Musée du Caire, est directeur d'études à l'École pratique des hautes études, Paris. G. S.

Legrain, Georges (1865-1917). Les temples de Karnak. Fragment

du dernier ouvrage de GEORGES LEGRAIN. Fondation égyptologique Reine Elizabeth, large quarto, 270 p., 163 fig. Bruxelles, VROMANT, 1929. ISIS

GEORGES LEGRAIN died at Karnak in 1917 after having devoted to the reconstruction of the great temples twenty-two years of his life. The present volume, admirably published, is an incidental fruit of his activity. It contains a very accurate description of the temples, unfortunately incomplete. That is, what we are given is complete in itself but represents only a part of the work which LEGRAIN had outlined in 1913. As it is, it is a splendid monument to his memory. LEGRAIN's explanations will be of very great interest to students of Egyptian technology, e.g., how was the temple planned, how were the immense columns built. G. S.

Rouillard, Germaine. L'administration civile de l'Egypte byzantine ; préface de CH. DIEHL. 2e édition. XV+268 p. 8 pl., figs. Paris, GEUTHNER, 1928. ISIS

Reviewed by LOUIS BRÉHIER, *Journal des savants*, 425-27, 1929.

Scharff, Alexander. Die Altertümer der Vor- und Frühzeit Ägyptens. XI+194 p., 102 fig., 38 pl. (Staatliche Museen zu Berlin. *Mitteilungen aus der Ägyptischen Sammlung*. Band V, 2. Teil.) Berlin, CURTIUS, 1929. ISIS

Reviewed by H. FRANKFORT, *Deutsche Literaturzeitung*, 6, 2000-03, 1929.

Stewart, Basil. The mystery of the great pyramid. Traditions concerning it and its connexion with the Egyptian « Book of the dead. » XI+138 p. London, ROUTLEDGE, 1929. ISIS

3. — BABYLONIA AND ASSYRIA

Babylonian astronomy (*Introduction*, 1, 71). Greifbarere Gestalt gewinnen durch die neueren Forschungen jetzt auch KIDENAS (*Κιδηνᾶς*=KIDINNU), (vgl. P. SCHNABEL, BEROSSOS 121-30, 218-19; 227-37 : um 314 v. Chr.), SUDINES (SCHNABEL 130-32, 3. Jahrh. v. Chr.) und NABURIANOS (Naburi' annu, — rimannu, um 427 v. Chr. : SCHNABEL 132-3, 222-27, 238-41). SUDINES verfasste auch ein Werk über Steine : SCHNABEL 131 f. (*Isis*, 10, 107). E. H. ISIS

Gadd, Cyril John. History and monuments of Ur. XV+270 p., London, CHATTO and WINDUS, 1929. ISIS

Langdon, S., Fotheringham, J. K. The Venus tablets of Ammizaduga, a solution of Babylonian chronology by means of the Venus observa-

tions of the first dynasty. With Tables for computation by CARL SCHOCH. VIII+109 p., 16 pl. London, Oxford University Press, 1928. ISIS

Reviewed by OTTO NEUGEBAUER in *Orientalistische Literaturzeitung*, 32, 913-21, 1929.

Neugebauer, Otto. Zur Frage der astronomischen Fixierung der babylonischen Chronologie. *Orientalistische Literaturzeitung*, 32, 913-21, 1 pl., 2 fig., 1929. ISIS

A critical review of the fundamental work of S. LANGDON, J. K. FOTHERINGHAM, and CARL SCHOCH (1928). The reviewer concludes : « Zusammenfassend möchte ich sagen, dass mir also auch dies letzte Argument in keiner Weise ' beweisend ' im strengen Sinne erscheinen kann, und dass die letzte Entscheidung über die babylonische Chronologie nach wie vor bei den Historikern zu liegen hat. Die Bedeutung des Werkes von LANGDON-FOTHERINGHAM-SCHOCH scheint mir gerade darin zu liegen, dass es erstmalig die klare Konstatierung dieses Tatbestandes ermöglicht. Aber wenn man auch dem Untertitel ' A solution of Babylonian chronology ' nicht bedingungslos zustimmen will, so wird man doch den Verfassern für die objektive, von jeder gehässigen Polemik freie Bearbeitung des ganzen einschlägigen Materials danken müssen. »

Schoch, Carl (d. 1929). The « arcus visionis » of the planets in the Babylonian observations. *Monthly Notices of the Royal Astron. Society*, 84, 731-34, 1923-24. ISIS

« The arcus visionis » of a star or « of a planet... is the depression of the Sun below the horizon, measured in the vertical circle for the moment when the star sets on the last evening when it is visible or rises on the first morning when it is visible, refraction being disregarded in the case of both bodies. »

A. P.

Spencer, Herbert. Descriptive sociology : or, groups of sociological facts, classified and arranged. Division 1, no. 13. Mesopotamia (The ancient inhabitants of the Tigris-Euphrates lands). Compiled and abstracted upon the plan organised by HERBERT SPENCER, by REUBEN LEVY. Issued by Mr. SPENCER's trustees (T. W. HILL, editor). IV+49 p., 4 tables. London, WILLIAMS and NORGATE, 1929. ISIS

4. — GREECE.

Clements, E. The interpretation of Greek music. *Journal of Hellenic Studies*, 42, 133-66, 1922. ISIS

Clements, E. Supplement to « The interpretation of Greek music »

(*J. H. S.*, 42, p. 133). *Journal of Hellenic Studies*, 45, 76-77, 1 fig., 1925. ISIS

Couissin, Pierre. Le stoïcisme de la Nouvelle Académie. *Rev. d'histoire de la philosophie*, 3, 241-76, 1929. ISIS

I. ARCÉSILAS; II. CARNÉADE; III. L'éclectisme (le Moyen Portique, PHILON et ANTIOCHUS).

Curtis, J. Reconstruction of the greater perfect system. *Journal of Hellenic Studies*, 44, 10-23, 1924. ISIS

Diels, Hermann. Doxographi Graeci. Collegit recensuit prolegomenis indicibusque instruxit HERMANN DIELS. x+854 p. (Opus academiae litterarum regiae Borrussicae praemio ornatum. Editio iterata.) Berlin, de GRUYTER, 1929 (RM. 28). ISIS

Gomperz, Theodor (1832, 09, 29-1912, 08, 29). Les penseurs de la Grèce. Histoire de la philosophie antique. T. 1. La philosophie antésocratique. Traduction de AUGUSTE REYMOND. 3e édit. française, conforme à la 4e édit. allemande ; préface de ALFRED CROISET. 560 p. Paris, PAYOT, 1928. ISIS

HENRI GOMPERZ, fils de l'auteur et son successeur dans la chaire d'histoire de la philosophie ancienne de l'université de Vienne, avait été chargé par son père d'une nouvelle édition de « Griechische Denker », dont la première remontait à 1903-12. Cette édition, la 4e allemande, a paru en 1922, avec les améliorations, les corrections que l'auteur avait notées lui-même sur son exemplaire de travail; la voici traduite en français, comme les éditions antérieures, par les soins éclairés d'AUGUSTE REYMOND. Une des plus grandes qualités des cette histoire des penseurs de la Grèce, c'est de faire de ces penseurs vraiment des hommes, placés dans leur milieu historique, vivant au milieu d'autres hommes, qui sont comme eux les fils d'une race, dont le tempérament et la psychologie tiennent fortement au sol natal dont la situation, la nature sont précisément examinées dans l'introduction. Rien n'est négligé, ni l'historiographie et les historiens, ni la médecine et les médecins. Et, fait assez rare, dans l'appareil critique, les savants français, anglais, russes, italiens sont aussi largement utilisés que les écrivains allemands. L'ouvrage est établi sur un tout autre plan que la « Philosophie der Griechen in ihrer geschichtlichen Entwicklung » d'EDUARD ZELLER (dont les 3 premiers volumes seuls ont été traduits en français par EMILE BOUTROUX, pour I et II, et par GUSTAVE BELOT, pour III) : ZELLER maniait des idées, des abstractions; GOMPERZ réintègre la pensée dans celui qui pense, et dont il modèle le portrait dans une grande fresque historique sans lacune. L. G.

Harris, Rendel. Apollo at the back of the north wind. *Journal of Hellenic Studies*, 45, 229-42, 1925. ISIS

On prehistoric and ancient routes relative to the amber trade. G. S.

Löwy, Emanuel. Polygnot. Ein Buch von griechischer Malerei. Textband u. Tafelband. 80 p., 100 fig. Wien, SCHROLL, 1929. ISIS

Reviewed by HANS DIEPOLDER, *Deutsche Literaturzeitung*, 6, 2066-68, 1929.

Lulofs, H. J. Antieke beschouwingen over de menschelijke stem. *Bijdragen tot de geschiedenis der geneeskunde*, 9, 314-27, 1929. ISIS

Magnien, Victor. Les mystères d'Eleusis : leurs origines, le rituel de leurs initiations. 224 p. Paris, PAYOT, 1929. ISIS

Reviewed by EVA M. SANFORD, *American Historical Review*, 35, 150, 1929.

Roussel, P. La Grèce et l'orient, des guerres médiques à la conquête romaine, avec la collaboration de P. CLOCHÉ et R. GROUSSET. 556 p., 2 maps. (Peuples et civilisations, histoire générale publiée sous la direction de L. HALPHEN et P. SAGNAC, Tome II). Paris, ALCAN, 1928. ISIS

Reviewed by R. DEMANGEL, *Journal des savants*, 350-8, 1929.

Schmid, Wilhelm ; Stählin, Otto. Geschichte der griechischen Literatur. Teil 1 : WILHELM SCHMID, Die klassische Periode der griechische Literatur. Bd. 1 : Die griechische Literatur vor der attischen Hegemonie. XIV+805 p. (Handbuch der Altertumswissensch. Begr. v. IWAN VON MÜLLER, neu hrsg. v. WALTER OTTO. 17 Abt., 1. Tl., Bd. 1.) München, BECK, 1929. ISIS

Reviewed by F. JACOBY, *Deutsche Literaturzeitung*, 6, 2290-98, 1929.

Sticker, Georg. Fieber und Entzündung bei den Hippokratikern. *Sudhoffs Archiv für Geschichte der Medizin*, 22, 361-81, 1929. ISIS

5. — ROME.

Celli, Angelo. Die Malaria in ihrer Bedeutung für die Geschichte Roms und der römischen Campagna : eine kulturhistorische Studie. Herausgegeben von ANNA CELLI-FRAENTZEL. VII+118 p. Leipzig, THIEME, 1929. ISIS

Original Italian edition, 1925, (*Isis*, 9, 211).

Gsell, Stéphane (1864-). Histoire ancienne de l'Afrique du Nord : t. 7, La république romaine et les rois indigènes ; t. 8, JULES CÉSAR et l'Afrique, fin des royaumes indigènes. 231 et 306 p. Paris, HACHETTE, 1928. ISIS

Reviewed by A. MERLIN, *Journal des savants*, 337-49, 1929.

Homo, Léon. Roman political institutions from city to state. Translated by M. R. DOBIE. XVIII+403 p. (The History of Civilization Series.) London, KEGAN PAUL, 1929. ISIS

List, Stephan. Aus dem technischen Schrifttum der Römer. 32 p. Aus dem naturwissenschaftlichen Schrifttum der Römer: I. Astronomie und Wissenschaft des Anorganischen. 32 p. II. Biologische Wissenschaften. 32 p. Leipzig, TEUBNER, 1928 (80 Pfg. each). ISIS

These booklets deserve to arrest our attention primarily by reason of the principle of education they represent. They are not vulgarisation pamphlets, but collections of scientific extracts from writers of old Rome intended for higher school-classes. They appear in the series *Eclogae Graecolatinae* (Nos. 49-51) which cover a wide field indeed. This very variety will appeal to the young student after struggling with CICERO's long speeches and hexameter lines by the hundred. The three numbers before us represent a new departure, in that they deal directly with the technical side of Roman mentality and culture. Thus the first opens with VITRUVIUS' sketch of the course of training of an architect, then gives the mode of structure of a dwelling-house, the choice of a site for a city, levelling, the laying of an aqueduct with (triple conduct-system). FRONTINUS gives next a survey of the aqueducts of Rome, while HYGINUS expounds the principles of land surveying and the laying out of a military colony. After a few passages on war technique, VITRUVIUS ends the booklet with his description of an ingenious taxameter. Dr. LIST prefixes a short but telling introduction sketching the lives of the authors in question and appends as foot-notes throughout, German translations of the more technical terms and brief comment. Three cuts help to visualise the more complicated subjects treated. The second booklet deals with astronomy and physiography, and the third with organic life. Here PLINY and SENECA are the chief writers borrowed from, and in an effective way. For PLINY has notable things to say for the roundness of the earth—and against the use of alcohol. And SENECA raises the question as to whether the earth stands still and the universe revolves or vice versa (Nat. Quaest. VII, 2). In all this there is much that will arrest the attention of any intelligent youth and so awaken in him an interest in the history of science. Dr. LIST is careful to point out that the Romans owe most of their technical wisdom to the Greeks. May we hope he will edit parallel collections of extracts from the writings of the great Hellenistic writers? In course of time one may hope for larger works of this kind, for both Greeks and Romans. College curricula are indeed pretty full already; but the day will surely come when educationalists will realize fully that solid mental training connotes a genial appreciation of the development of scientific thought. There is besides a gentle beauty about the childhood of science that it has thrown off in these, its manhood days.

H. G. BÉVENOT.

Ramsay, A. M. The speed of the Roman imperial post. *Journal of Roman Studies*, 15, 60-74, 1 fig., 1925. ISIS

Wagoner, G. W. An Etruscan bronze statuette depicting a posterior superior dislocation of the hip. *Annals of medical history*, 1, 599, 1929. ISIS

II. MIDDLE AGES

6. — MIDDLE AGES (*generalities*).

Andrews, Michael C. The study and classification of medieval mappae mundi. *Archaeologia*, 75, 61-76, 2 pl., 1926. ISIS

The author's classification is as follows:

Family	Division	Genus	Species
Oecumenical	(A) Tripartite	(1) T-O	(a) Isidore (b) Sallust (c) Gauthier de Metz
		(2) Y-O	
		(3) □-V	Isidore
	(B) Simple	—	(a) Early (b) Hereford-Ebstorf (c) Higden (d) Matthew Paris
Intermediate	—	—	Beatus
Hemispherical	(A) Oceanic	(1) Simple	(a) Lambertus of St. Omer (b) William of Conches
		(2) Zone	(a) Macrobius (b) William of Conches
	(B) Non-Oceanic	Climate	(a) Petrus Alphonsus (b) Petrus Alliacus (c) Sacrobosco

Anitchkof, Eugène. L'esthétique au moyen-âge. *Le moyen âge*, 29, 221-58, 1918. ISIS

Bigwood, Georges. Le régime juridique et économique du commerce de l'argent dans la Belgique du Moyen Age. Vol. 1, 683 p., table; vol. II, 497 p., table (*Mémoires publ. par l'Académie royale de Belgique, classe des lettres*. 2e série, vol. 14 and 14^2). Bruxelles, Hayez, 1921-1922. ISIS

Reviewed by Georges Espinas, *Le moyen âge*, 34, 272-81, 1923.

Bittermann, Helen Robbins. The organ in the early middle ages. *Speculum*, 390-410, 1929. ISIS

« The chroniclers to the contrary, the first organ brought into Western Europe was not the one included among other gifts sent to PEPIN, King of the Franks, by messengers from the eastern Emperor, CONSTANTINUS COPRONYMUS, in 757. For two centuries at least, the organ had been used in connection with the church service in Gaul; and for six centuries before that, it had been in demand as a solo instrument on feast days and on similar occasions in the Roman Empire. Emperors had improvised on it. It had blared paeans of victory for successful contestants in the games. Wealthy men had eaten their dinners to its noisy accompaniment. Poets mentioned it in their songs. So it is no novelty imported into the west from Byzantium with which we are dealing, but an instrument well known to the musicians of the Roman Empire. »

Dieudonné, A. Les poids du moyen âge et la numismatique. D'après une étude publiée en 1906. *Le moyen âge*, 31, 157-73, 1920. ISIS

Apropos of P. GUILHIERMOZ : Note sur les poids du moyen âge (*Bibl. de l'École des chartes*, 67, 161-233, 402-50, 1906).

Flemming, Percy. The medical aspects of the mediaeval monastery in England. *Proceedings of the Royal Society of Medicine* (Section on the history of medicine, 25-36), 22, 771-782, 6 fig., London, 1929. ISIS

FLEMMING thinks that the « infirmary » of a monastery was rarely used for those residing outside of the precinct and that it was in no sense a « hospital » such as existed in many towns in the middle ages. It was usually detached from the main building. The one, still intact, at Chichester is typical of a monastic infirmary. FLEMMING gives details of it, illustrating his article with photographs and plans. Patients consisted mostly of the older monks, the sick and those undergoing a periodical blood-letting. There is little regarding the sick, although we know there were many « neurasthenics ». Monks were bled seven or more times a year.

FLEMMING's paper covers many other important points, especially in regard to the water supply and sanitation of monasteries. A bibliography is appended. The paper, though short, is valuable. H. R. V.

Ghellinck, Joseph de. Les Franciscains en Chine aux XIII^e^ et XIV^e^ siècles (Ambassadeurs et missionnaires). *Xaveriana*. Publication mensuelle, no. 42 et 44. 40 p. chacune de très petit format (16 × 10 cm.) Louvain, Museum Lessianum, Juin et Août, 1927. ISIS

Publication populaire mais fort bien documentée. G. S.

Grandclaude, Maurice. Étude critique sur les livres des Assises de Jérusalem. 185 p. Paris, JOUVE, 1923. ISIS

Reviewed by GEORGES RECOURA, *Le moyen âge*, 35, 151-66, 1924-25.

Heck, Philipp. Die Entstehung der Lex Frisionum. Mit einem Anhang : Abdruck der Heroldschen Texte. IX+157 p. (*Arbeiten z. dtsch. Recht- u. Verfassungsgesch.*, hrsg. v. JOH. HALLER, PH. HECK u. A. B. SCHMIDT. H. 6). Stuttgart, KOHLHAMMER, 1927. ISIS

Reviewed by F. BEYERLE, *Deutsche Literaturzeitung*, 6, 2408-11, 1929.

Kenney, James F. The sources for the early history of Ireland. An introduction and guide. In 2 vols. Vol. 1. Ecclesiastical. XVI+807 p., 2 maps. (Records of civilization). New York, Columbia University Press, 1929 ($ 12.50). ISIS

« The work of which the present volume is the first part is designed to serve as an introduction and guide to the study of the written sources for the early history of Ireland, so far as they have been made available in print. The period treated is that prior to the Anglo-Norman invasion, and terminates about A.D. 1170. » « The scope of this survey has been made as broad as possible so as to cover all significant documents illustrative of old Irish life and civilisation. The sources listed are primarily those that can be consulted in printed editions, but notice has also been taken of some of the relatively few texts that are still confined to the manuscripts. Moreover, although the book is not a catalogue of manuscripts, some account is given of all important codices, written by Irish hands or under Irish influence within the period under consideration, of which facsimiles, analyses of the contents, or other descriptions have been published. The normal treatment of each source is to give, first, the title and the date, or approximate date, followed by the incipit and explicit of the text; then a bibliographical paragraph, listing manuscripts and editions and the more valuable commentaries in books or periodicals; finally, a summary exposition of the character and significance of the document, and of the results of such noteworthy critical study as it may have received. » The Ms. was completed in Nov. 1926, but later addenda are published at the end (p. 773-90). The work has obviously been done with meticulous and loving care. The first chapter is a sort of introduction containing an outline of Irish history, and a most interesting account of Irish studies in Ireland and abroad (p. 52-109), with short biographical sketches of the leading scholars and abundant references. Much of this was entirely new to me. The sources themselves are divided as follows : 2. Ireland in the ancient world, to about 700 (NENNIUS); 3. The Irish church in the Celtic period, fourth to seventh century; 4. The monastic churches, their founders and traditions—part 1 : The primitive foundations; 5. The monastic churches—part 2 : Churches of the sixth to ninth centuries; general treatises; 6. The expansion of Irish Christianity, from the seventh to the twelfth century; 7. Religious literature and ecclesiastical culture, seventh to twelfth century; 8. The reform movement of the twelfth century. In all, 659 sources have been considered and our information about them carefully summarized. This is completed by an elaborate index and two maps. The second volume of this important work will be awaited with impatience. G. S.

Larsen, Henning. « Woo't drink up eisel »? Studies in English

Philology, a miscellany in honor of FREDERICK KLAEBER, 401-2, Minneapolis, Minn., University of Minnesota Press, 1929. ISIS

The hypothesis eisel = Lat. *acetillum* seems confirmed by an old Icelandic text.

Lot, Ferdinand. Mélanges d'histoire du moyen âge offerts à FERDINAND LOT. XLI+740 p. 10 pl., 10 fig., port., Paris, CHAMPION, 1925. ISIS

Includes a portrait, and a critical bibliography of LOT's writings. Three papers of this collection are registered above under the thirteenth century. (*Isis*, 9, 551). G. S.

Magoun, F. P., jr. Football in mediaeval England and in middle-English literature. *American Historical Review*, 35, 33-45, 1929. ISIS

Rodocanachi, E. La corporation des médecins et des pharmaciens de Florence. *Bull. Acad. des sciences mor. et polit.*, 55-64, juillet-août, 1929. ISIS

Salter, H. E. Facsimiles of early charters in Oxford muniment rooms. XI+103 p., 102 pl. Oxford, University Press, 1929. ISIS

« As the Colleges of Oxford possess 50,000 deeds earlier than the year 1520, it is a disappointment to find that there are less than forty of them which date before the year 1154; in fact, there would have been only three had it not been that four of the Colleges annexed or superseded monastic houses and retained their deeds. The deeds of the abbey of Oseney and of the priories of Sele, Takeley, and Monk Sherborne have passed into the keeping of Christ Church, Magdalen, New College, and Queen's College respectively, and without them the early charters of Oxford would be worth but little. The case of MERTON is particularly disappointing. As WALTER DE MERTON purchased manors for his College shortly after the middle of the thirteenth century it would be thought that the title-deeds he acquired would give the previous history for at least a hundred years; but in each case the series begins with the reign of JOHN. No doubt the explanation is that when land was bought and sold in the twelfth century a deed was not always necessary. Often the transaction took the form of subinfeudation, and the purchaser was admitted as tenant at the court of the lord by some public ceremony, so that a charter was not drawn up. If land was given to a monastery the case was different, and the following pages show how large a part of our earliest deeds is the result of the existence of monasteries. This volume, however well done, could never compare with the delightful volume of Charters in the British Museum, issued in 1903. The Museum, with nearly 100,000 charters, of which the Cotton, Harleian, and other collections are the pick of many thousands, is ten or fifteen times as rich as Oxford, and in compiling that volume only those deeds which were of most interest and in the finest condition were selected. »

Schlafert, Thérèse. Le Haut-Dauphiné, au moyen âge. XIX+765 p. Paris, Recueil Sirey, 1926. ISIS

Reviewed by G. DUPONT-FERRIER, *Le moyen âge*, 37, 59-62, 1927.

Seymour, St. John D. Anglo-Irish literature, 1200-1582. 170 p. Cambridge University Press, 1929. ISIS

Singer, Charles. The dark age of science. *The Realist*, 2, no. 2, 281-95, 1929. ISIS

Théry, P. G. (O. P.). LOUIS ROUGIER et la critique historique. 126 p. Paris, *Revue des Jeunes*, 1927. ISIS

Reviewed by EMILE A. VAN MOÉ, *Le moyen âge*, 38, 85-87, 1928.

Thorndike, Lynn. A history of magic and experimental science during the first thirteen centuries of our era. Second printing with corrections. In two volumes. Vol. 1, XL+835 p., vol. 2, VII+1036 p. London, MACMILLAN, 1929. ISIS

Todd, T. Wingate. The mediaeval physician. *Annals of medical history*, 1, 615-28, 1929. ISIS

Tout, Thomas Frederick. Chapters in the administrative history of mediaeval England. Vol. III and IV. Manchester, University Press, 1928. ISIS

Reviewed by CH. PETIT-DUTAILLIS, *Journal des Savants*, 299-308, 1929.

Van Puyvelde, L. Un hôpital du moyen âge et une abbaye y annexée. La Biloke de Gand. 124 p., 51 pl., 2 plans, Gand, VAN RIJSSELBERGHE, 1925. ISIS

Reviewed by A. PHILIPPE, *Le moyen âge*, 38, 109-13, 1928.

7. — BYZANTIUM.

Grabar, André. Recherches sur les influences orientales dans l'art balkanique. XIII+151 p., 28 fig., 16 pl. (*Publications de la Faculté des Lettres de l'Université de Strasbourg*, fasc. 43). Paris, Soc. Les Belles Lettres, 1928. ISIS

Reviewed by LOUIS BRÉHIER, *Journal des savants*, 378, 1929.

Valdenberg, Vladimir. Sur le caractère général de la philosophie byzantine. *Rev. d'histoire de la philosophie*, 3, 277-95, 1929. ISIS

Aucune des tentatives faites jusqu'à présent pour déterminer le caractère général de la philosophie byzantine ou pour indiquer les traits caractéristiques

de son développement (N. GUIAKUMAKIS, A. CATOIRE, I. V. KIRČEVSKIJ, T.KOUGANOV) n'est satisfaisante. Il faut d'abord s'occuper d'une étude détaillée des penseurs byzantins et des systèmes philosophiques particuliers, en prêtant une attention spéciale à la manière de formuler les problèmes philosophiques, analyser les méthodes employées par les auteurs et déterminer leur dépendance de la philosophie antique, du christianisme, et, s'il y a lieu, des doctrines philosophiques de l'Orient. Après cela seulement pourra être résolu le problème du caractère général de la philosophie byzantine, dont on pourra enfin écrire une histoire spéciale, et qui entrera dans l'histoire universelle de la philosophie. L. G.

III. ORIENTAL SCIENCE AND CIVILIZATION

8. — ASIA (*generalities*).

Berlin, Staatsbibliothek. Katalog der Handbibliothek der Orientalischen Abteilung. Hrsg. v. d. Preuss. Staatsbibliothek. XI+573 p. Leipzig, HARRASSOWITZ, 1929. ISIS

Reviewed by G. BERGSTRÄSSER, *Deutsche Literaturzeitung*, 6, 1945-47, 1929.

Lachmann, Robert. Musik des Orients. 136 p., 12 pl. (Jedermanns Bücherei). Breslau, HIRT, 1929. ISIS

Reviewed by HENRY GEORGE FARMER, *Journal of the Royal Asiatic Society*, 940-42, 1929.

Salmony, Alfred. The museums of Siberia. *Parnassus*, 2, 14-16, 1 fig., New York, 1930. ISIS

A. SALMONY, of the Museum of East Asiatic Art, Cologne, Germany, gives a brief account of some of the treasures he has seen in the museums of Tomsk, Krasnoyarsk, Minussinsk, Irkutsk, Chita, etc. Some of the recent finds mentioned are of the highest interest to students of the history—and prehistory—of Asiatic and American civilizations. A. P.

Western Asia.

Baur, P. V. C. ; Rostovtzeff, M. J. The excavations at Dura-Europos, conducted by Yale University and the French Academy of Inscriptions and Letters. Preliminary report of first season work, spring of 1928. With a preface by JAMES ROWLAND ANGELL. X+77 p., 5 pl., 23 fig. New Haven, Yale Univ. Press, 1929. ISIS

Reviewed by E. BICKERMANN, *Deutsche Literaturzeitung*, 6, 2163-66, 1929.

Dalman, Gustaf. Arbeit und Sitte in Palästina. Bd. 1 : Jahreslauf und Tageslauf. 2. Hälfte : Frühling und Sommer. VIII+p. 281-698, 38 fig. (*Schriften d. Dtsch. Palästina-Inst.*, hrsg. v. G. DALMAN. 3. Bd., 2. Hälfte.) Gütersloh, BERTELSMANN, 1928. ISIS

Reviewed by LUDWIG KÖHLER, *Deutsche Literaturzeitung*, 6, 1948, 1929.

Furlani, Giuseppe. Leggi dell' Asia Anteriore antica. XII+113 p. (*Publicazioni dell' Istituto per l'Oriente.*) Rom. Istituto per l'Oriente, 1929. ISIS

Reviewed by M. SAN NICOLÒ, *Deutsche Literaturzeitung*, 6, 2318-19, 1929.

Garstang, John. The Hittite Empire : being a survey of the history, geography and monuments of Hittite Asia Minor and Syria. XVII+364 p., 53 pl. London, CONSTABLE, 1929. ISIS

Reviewed by A. H. S., *Journal of the Royal Asiatic Society*, 894-98, 1929.

Macler, Frédéric. L'enluminure arménienne profane. 44 p., 93 pl., 7 fig. Paris, GEUTHNER, 1928. (300 frs.) ISIS

Avant-propos; Introduction; Notices et descriptions; Manuscrit 424 de Saint-Lazare (Venise); Feuillet 442 de Vienne (Mekhitharistes); Photographies communiquées par GREGOR AHAROM; Manuscrit 319 des PP. Mekhitharistes de Vienne; Parisinus arménien 291; Formules magiques ou talismaniques. — « De cette enquête, il semble résulter que les Arméniens ont eu, comme les autres peuples civilisés du Proche Orient, une enluminure profane, qui nous a laissé des traces qu'il convient de sauver de l'oubli. Il y eut certainement des ouvrages de médecine enluminés; il y eut également des manuscrits donnant des portraits de rois, de reines et de grands personnages. Mais les manuscrits arméniens qui ont laissé le plus de documents enluminés profanes sont sans conteste les Vies d'ALEXANDRE LE MACÉDONIEN. M. MACLER en publie trois, une de Venise, une de Vienne et une de Paris qui, d'époques assez différentes, présentent le plus vif intérêt pour l'étude de la peinture chez les Arméniens. Le volume se termine par la publication d'une enluminure spéciale, constituée par la figuration de *dew* ou démons qui, au nombre de 72, sont tour à tour appelés par SALOMON à l'effet d'expliquer au roi hébreu pourquoi sa fille est stérile ».

Osten, H. H. von der. Explorations in Hittite Asia Minor, 1927-28. VII+153 p., 160 fig. (*Oriental Institute Communications*, no. 6). Chicago, University of Chicago Press, 1929. ISIS

Most interesting report with 160 illustrations. The expedition's itinerary covered more than 3100 km., many Hittite monuments being examined. The most interesting at first view is the huge « arslan tash » near Hawus Köi, a lion in basalt 2 m. long (p. 71). Says the author in the introduction (p. 2) : « The Hittite question has now become more than a trivial, purely scientific caprice. It has become a vital point in our understanding of our own civilization. Not as a single people nor as an isolated culture problem are the Hittites of interest to us. In them we have now to see one of the most ancient historical peoples, living for nearly a thousand years in a land which played perhaps the most important part during the earliest period of the use of metal; and in addition to their native culture we shall probably

find in them survivals of still older peoples, leading us as far back as the Stone Age.» G. S.

Sayce, A. H. The early geography of south-eastern Asia Minor. *Journal of Hellenic Studies*, 43, 44-9, 1923. ISIS

Central Asia.

David-Neel, Alexandra. Arjopa. Die erste Pilgerfahrt einer weissen Frau nach der verbotenen Stadt des Dalai Lama. 322 p., 45 fig., map. Leipzig, BROCKHAUS, 1928. ISIS

Reviewed by A. H. FRANCKE, *Deutsche Literaturzeitung*, 6, 1785-86, 1929.

David-Neel, Alexandra. Le Thibet mystique. *Revue de Paris*, 15 février, 1928. ISIS

David-Neel, Alexandra. Les phénomènes psychiques au Thibet. Théories et pratiques. *Revue de Paris*, 1 décembre, 1929. ISIS

Filchner, Wilhelm. Om Mani Padme Hum. Meine China- und Thibet-Expedition 1925-28. Mit 103 Abbildungen und Skizzen sowie einer Übersichtskarte. IX+352 p., 103 ills., map. Leipzig, BROCKHAUS, 1929. ISIS

Reviewed by C. MABEL RICKMERS, *Journal of the Royal Asiatic Society*, 932-34, 1929; by AUG. HERM. FRANCKE, *Deutsche Literaturzeitung*, 6, 2316-18, 1929.

Hedin, Sven. Auf grosser Fahrt: Meine Expedition mit Schweden, Deutschen und Chinesen durch die Wüste Gobi 1927-28. XII+347 p., map, ills., index. Leipzig, BROCKHAUS, 1929. ISIS

Reviewed in *Geographical Review*, 694-96, 1929.

Macmunn, Sir George. Afghanistan. From DARIUS to AMANULLAH. XII+359 p. London, BELL, 1929. ISIS

Rapson, E. J.; Noble, P. S. Kharosthi inscriptions. Discovered by Sir AUREL STEIN. In Chinese Turkestan, part III., Text of inscriptions discovered at the Niya and Lou-lan sites, 1913-14. Described and edited by E. J. RAPSON, and P. S. NOBLE. With complete index verborum. p. 267-379. Published under the authority of His Majesty's Secretary of State for India in Council. Oxford, Clarendon Press, 1929. ISIS

Stein, Sir Aurel. Innermost Asia. Detailed report of explorations

in Central Asia, Kan-su and eastern Iran, carried out and described under the orders of H. M. Indian Government. Vol. 1, text, XXXIX+ p. 1-547 ; vol. 2. text, XII+p. 549-1159 ; vol. 3., pl. and plans, XIp., 137 pl., 59 plans ; vol. 4, maps. Oxford, Clarendon Press, 1928. ISIS

Reviewed by F. W. THOMAS, *Journal of the Royal Asiatic Society*, 944-51, 1929.

Eastern Asia.

(*Including works relative to the whole of Buddhist Asia, or to India, Central and Eastern Asia combined*)

Coedès, George. Les collections archéologiques du Musée National de Bangkok. (Ars Asiatica, XII). 117 p., 40 pl. Paris, VAN OEST, 1928. ISIS

Reviewed by C. O. BLAGDEN, *Journal of the Royal Asiatic Society*, 936-37, 1929.

Groslier, George. La sculpture khmère ancienne. 91 p., map, 155 pl. (*Collection française des Arts Orientaux*). Paris, CRÈS, 1925. ISIS

Reviewed by V. GOLOUBEW, *Bulletin de l'École française d'Extrême-orient*, 27, 350-59, 1927.

Maspero, Georges. Le royaume de Champa. VII+278 p., 40 pl. Paris, VAN OEST, 1928. ISIS

Reviewed by C. O. BLAGDEN, *Journal of the Royal Asiatic Society*, 938, 1929.

Robequain, Charles. Le Thanh Hoá. Étude géographique d'une province annamite. 2 vols., 636 p., 33 ills., 48 pl., 7 maps. (*Publications de l'Ecole française d'Extrême-Orient*). Paris, VAN OEST, 1929. ISIS

Reviewed by C. O. BLAGDEN, *Journal of the Royal Asiatic Society*, 939, 1929; by J. BACOT, *Journal des Savants*, 427, 1929.

Schrieke, Bertram Johannes Otto (*editor*). The effect of Western influence on native civilisations in the Malay archipelago. VII+ 247 p. (Royal Batavia Society of Arts and Sciences.) London, LUZAC, 1929. ISIS

9. — INDIA.

Dahlmann, Joseph (S. J.). Indische Fahrten. 2 Bde. 2. verb. Aufl. XVII+344 p., 63 pl., map. ; XV+311 p., 60 pl., 2 maps. Freiburg i. Br., HERDER, 1927. ISIS

Reviewed by JOH. NOBEL, *Deutsche Literaturzeitung*, 6, 2406-08, 1929. First published 1908.

Dodwell, H. H. (*editor*). The Cambridge history of India. Volume V : British India (1497-1858). XXII+684 p. Cambridge University Press, 1929. ISIS

This volume is also published as The Cambridge history of the British Empire and can be obtained with the title-page and in the binding of either series.

Karandikar, S. V. Hindu exogamy. XV+308 p. (University of Bombay Publication.) Bombay, TARAPOREVALA, 1929. ISIS

Karpinski, Louis C. The unity of Hindu contributions to mathematical science. *Scientia*, 382-88, juin, 1928. ISIS

Newcomb, Rexford. Ceramic decoration in India. 32 p., 32 fig. (*Architectural monographs on tiles and tilework*. No. 6). New York, Associated Tile Manufacturers, 1928. ISIS

Smith, David Eugene GEORGE RUSBY KAYE (1866-1929). *Archeion*, 11, 230-31, 1929. ISIS

Notice nécrologique. (Voir *Isis*, 2, 326-56; 12, 132-45, 157-61; et de nombreuses notes éparses dans les différentes bibliographies critiques).

Tattabhusan, (Pandit) Hemchandra Goswami. Kamaratna Tantra. 110 p., diagrams. Shillong, Assam Government Press, 1928. ISIS

Reviewed by R. P. D., *Journal of the Royal Asiatic Society*, 922-23, 1929. « This little book consists of an Assamese version of an older Sanskrit work, accompanied by a translation into English. The original Assamese text is said to be written on oblong strips of bark and to be not less than 300 years old. The present text is taken from a copy of this original book, which is in the possession of the NA-GOSAIN family of North Gauhati. It consists of 129 magical formulae or recipes, many of which are grossly indecent. »

Weckerling, Adolf. Die Tridosa-Lehre in der indischen Medizin. *Dissertation* z. Erlang. d. Doktorw. b. d. Philos. Fakult. d. Hess. Land.-Univ. zu Giessen. 57 p. Giessen, 1929. ISIS

Reviewed by REINHOLD F. G. MÜLLER, *Mitteilungen zur Geschichte der Medizin und der Naturwissenschaften*, 29, 30-1, 1930.

Wüst, Walther. Indisch. 112 p. (*Grundriss d. indogerman. Sprach- u. Altertumskd.*, begr. v. K. BRUGMANN u. ALB. THUMB. Hrsg. v. A. DEBRUNNER u. FERD. SOMMER. Geschichte der indogermanischen Sprachwissenschaft. II. Tl. : Die Erforschung der

indogermanischen Sprachen. Bd. 4, 1. Hälfte.) Berlin, DE GRUYTER, 1929. ISIS

Reviewed by E. ABEGG, *Deutsche Literaturzeitung*, 6, 2242-44, 1929.

Zimmer, Heinrich. Spiel um den Elefanten. Ein Buch von indischer Natur. 184 p., 10 fig. München, OLDENBOURG, 1929. ISIS

Reviewed by SCHMUTZER *Mitteilungen zur Geschichte der Medizin und der Naturwissenschaften*, 29, 51, 1930.

10. — CHINA.

Hashimoto, Masukichi. Origin of the compass. *Memoirs of the Research Department of the Toyo Bunko*, no. 1, 69-92, Tokyo, 1926. ISIS

Very valuable paper mainly derived from Chinese sources which are duly quoted. The account is so elaborate and intricate that it is rather difficult to follow it. See my own note on the subject in my *Introduction* (vol. 1, 764, 1927). The author states that in the *Tung-hua-lu* written by TS'ÊNG SAN-I about the end of the twelfth century there is an account of the tzŭ-wu-chên (or compass), stating the deviation of the magnetic needle (the relevant Chinese text is given in a footnote). The author's final conclusion may be quoted in extenso. « The 'south-pointing vehicle,' or the chih-nan-ch'ê, has no relation to the polarity of a lodestone or the magnetic needle, and even if it seems likely that the lodestone may have been known separately in the West and the East, the magnetic needle, its deviation, and perhaps their application to navigation were discovered in China for the first time; however, we have no reliable evidence to decide whether the knowledge in China had some relation to that in Arabia and in Europe. At any rate, it seems certain that Arab sailors made use of the polarity of a lodestone or a magnetic needle for a long time to ascertain their ship's position. At last in Europe it developed into the perfect mariner's compass, while in China we cannot perceive any improvement of it, until the mariner's compass was introduced there from the West. » G. S.

Hummel, Arthur W. and **Swingle, Walter T.** Chinese and other East Asiatic books added to the Library of Congress, 1928-1929. Extract from the *Report of the Librarian of Congress for the year* 1928-29, p. 285-333, Washington, 1929. ISIS

This report contains as usual (see *Isis*, 13, 217) a mass of valuable information on Chinese writings. To analyze it here would take too much space, but the following item may be quoted by way of illustration: « The largest accession in the field of Chinese literature, made possible through the liberality of a member of the Trust Fund Board, was the family library of Mr. WANG SHU-AN, of Tientsin. A few of the items in this great collection are yet to arrive, but those now in the library number 1,644 titles in 22,100 volumes. Eighty-seven of these works are old manuscripts ranging from the fifteenth to the early part of the ninth century; 94 others are rare and beautiful palace

editions; 1 is a printed book of the twelfth century; and no fewer than 276 works are 'Ming editions' printed between the years 1368 and 1644 A.D. Almost a third of the Wang Family Library, or 569 items, is devoted to the collected writings of individual Chinese authors, a field of literature in which the Library of Congress had hitherto been inadequately represented. Not a few of the printed works are movable type editions of the Ming period, and others are chü chen pan, or movable type editions, of the eighteenth century. These form valuable additions to the Library's impressive examples showing the rise, development, and antiquity of the printer's art in China. Five of the works printed during the Ming period are from the famous Chi Ku Ko—a library known to all Chinese bibliophiles. Thirty-eight works of the sixteenth century are so-called 'red and black editions' (chu mo pan) in which the text is printed in large black characters and the commentary in smaller red ones. Others are specimens of 'ching ch'ang editions' in which the Ming emperors were wont to print the classics, comparable to the 'chien pan' issued by the Imperial Academy (kuo tzu chien) during the Manchu period.» See also my note on TS'AI HSIANG, above (second half of the eleventh century). G. S.

Maspero, Georges. La Chine. Nouvelle édition mise à jour. Préface d'A. DUBOSCQ. 2 vols. XX+310 p.; 260 p. (*Bibliothèque d'histoire et de politique*). Paris, DELAGRAVE, 1929. ISIS

Reviewed by E. GASPARDONE, *Bulletin de l'École française d'Extrême-orient*, 27, 387-89, 1927.

Piper, Hartmut. Die Gesetze der Weltgeschichte. Der gesetzmässige Lebenslauf der Völker Chinas und Japans. XV+110 p. Leipzig, WEICHER, 1929. (RM. 3,50). ISIS

This book is a part of a very ambitious collection founded and edited by the author, under the title Die Gesetze der Weltgeschichte, Völkerbiologie. It forms the first part of the second section (Völkerbiographie und -biologie der Menschheit), and contains a very condensed account of Chinese and Japanese history, together with an account, even briefer (4 p.) of European history for the sake of comparison. According to the author, the political evolution of every people passes through the following stages: 1. Patriarchalische Monarchie der Kindheit; 2. Aristokratie der Jugend; 3. Absolutismus der Frühreife; 4. Konstitutionalismus der Vollreife; 5. Imperialismus der Spätreife; 6. Cäsarismus des Alters; 7. Marasmus des Greisentums. This is so obvious to him, that when he has to write the history of any people, it is not necessary to try to divide the subject in any other manner; the account can be easily divided into seven chapters of which the titles are those just given! This is in fact what he does for China, Japan, and Europe. The seven ages of mankind! G. S.

Wilhelm, Richard. Chinesische Philosophie. 128 p., 15 fig., 1 pl. (Jedermanns Bücherei. Abt.: Philosophie. Hrsg. v. ERNST BERGMANN.) Breslau, HIRT, 1929. ISIS

Reviewed by A. FORKE, *Deutsche Literaturzeitung*, 6, 1806-10, 1929.

Wilhelm, Richard. A short history of Chinese civilization. With an introduction by LIONEL GILES. 51 ills., 2 maps. New York, Viking Press, 1929. ISIS

With, Karl. Chinesische Kleinbildnerei in Steatit. 142 p., pl., 47 fig. Oldenburg, STALLING, 1926. ISIS

Reviewed by F. M. TRAUTZ, *Deutsche Literaturzeitung*, 6, 2399-2400, 1929.

Wong, Y. W. WONG's system for arranging Chinese characters, the revised four-corner numeral system. 143 p. Shanghai, Commercial Press, 1928 ($ 0.75). ISIS

WONG's system of classification is undoubtedly far superior to any other for practical purposes, not only because it is considerably easier and quicker to use, but also because the numbers give one already some idea of the character represented. However, with all its advantages, it has two disadvantages thus far as compared with the GILES's system employed in SARTON's *Introduction* and in *Isis*. That is, the WONG's number represents generally more than one character (I admit that 28% represent less than 3 characters, 38%, less than 4, 55%, less than 6); GILES' number represents never more than one character, it is absolutely unambiguous; moreover, it represents also—and this is important for our special purpose,—one standard romanization. WONG's account of his great invention is very clear and very interesting to read. It includes a brief review of the other systems and an explanation of the genesis of the new one. It is followed by a vocabulary of 7,334 characters arranged according to the new method. The author has considerable experience and speaks with unusual authority, being the director of the Oriental Library of Shanghai and the editor in chief of that immense organization, The Commercial Press, of Shanghai. G. S.

11. — JAPAN.

Asakawa, Kanichi. The documents of Iriki: illustrative of the development of the feudal institutions of Japan. Translated and edited by K. ASAKAWA. XVI+142 p. (142 p. in Japanese and Chinese). New Haven, Yale University Press, 1929. ISIS

Reviewed by YAMATO ICHIHASHI, *American Historical Review*, 35, 95-6, 1929.

Ehmann, Paul. Die Sprichwörter und bildlichen Ausdrücke der japanischen Sprache. 2. Aufl. XXII+425 p. (Supplem. d. *Mitteilungen d. Dtsch. Gesellsch. f. Natur- u. Völkerkde. Ostasiens.* Bd. 3.) Tokyo, 1927. ISIS

Reviewed by CL. SCHARSCHMIDT, *Deutsche Literaturzeitung*, 6, 2289-90, 1929. First edition, 1897-8.

Gudger, E. W. Fishing with the cormorant in Japan. *Scientific Monthly*. 29, 5-38, 31 fig., 1929. ISIS

For an earlier paper by the same author on cormorant fishing in China, see *Isis*, 10, 277.

Kuwaki, Ayao. Development of the study of science in Japan. 15 p. (*Western influences in modern Japan*, a series of papers on cultural relations, no. 5). Japanese Council, Institute of Pacific Relations, 1929. ISIS

Nitobé, Inazo. Le Bushido. L'âme du Japon. Traduction française de CHARLES JACOB. Préface d'ANDRÉ BELLESSORT. 267 p. Paris, PAYOT, 1927. ISIS

Reviewed by E. AUBOUIN, *Bulletin de l'École française d'Extrême-orient*, 27, 406-10, 1927.

Okakura, Kakuzo. Le livre du thé. Traduit de l'anglais par GABRIEL MOUREY. 163 p. Paris, DELPEUCH, 1927. ISIS

Reviewed by E. AUBOUIN, *Bulletin de l'École française d'Extrême-orient*, 27, 411-13, 1927. Original English edition, 1906.

Torii, Riuzo. Les dolmens de la Corée. *Memoirs of the Research Department of the Toyo Bunko*, no. 1, 93-100, 3 pl., map., Tokyo, 1926. ISIS

Very interesting study on the megalithic monuments of Korea. The subject was quite new to me. There is no mention of Korean dolmens in G. G. MACCURDY's survey (Human origins, vol. 2, 121, 1924). Says MACCURDY : « Dolmens are common to Asia... They are found as far east as India. » Now according to TORII, they are relatively rare in Asia, except in Korea, where they are relatively abundant,—a statement corroborated by a map showing their distribution all over the peninsula. Two examples, representing respectively the southern and northern types, and also a type of menhir, are reproduced. G. S.

12. — ISRAEL.

Aešcoly-Weintraub, Aaron. Z. Le hassidisme. Essai critique. LI+202 p. (Introduction à l'étude des hérésies religieuses parmi les juifs. La Kabbale.) Paris, GEUTHNER, 1927. ISIS

Reviewed by L. BLAU, *Deutsche Literaturzeitung*, 6, 2236-37, 1929.

Anchel, Robert. NAPOLÉON et les Juifs. XXI+598 p. Paris, Les Presses Universitaires de France, 1928. ISIS

Reviewed by HENRY E. BOURNE, *American Historical Review*, 34, 123-25, 1928.

Benarus, Adolfo. Os Judeus. Lisbon, Sociedad Portugal-Brazil. 1927. ISI

Bodenheimer, F. S.; Theodor, O. Ergebnisse der Sinai-Expedition 1927 der Hebräischen Universität, Jerusalem. 143 p., 24 pl. Leipzig, HINRICHS'sche Buchhandlung, 1929. ISIS

Reviewed in *Nature*, 124, 1003, 1929. « The expedition visited some classical localities where manna was recorded. In the course of investigations, it was established beyond doubt that the appearance of manna is a phenomenon well known in other countries under the name of 'honey-dew', which is a sweet excretion of plant-lice *(Aphidae)* and scale-insects *(Coccidae)*. Two scale insects mainly responsible for the production of manna were found, namely, *Trabutina mannipara*, EHRENB., occurring in the lowlands, and *Najacoccus serpentinus* var. minor Green, which replaces the former in the mountains. Two other Hemipterous insects, *Euscelis decoratus* HAUPT and *Opsius jucundus* LETH., also produce manna, but to a lesser extent. All these insects live on *Tamarix nilotica* var. *mannifera* EHRENB.; no manna was observed on other species of *Tamarix*, a fact probably due to some physiological peculiarities of the former. »

Bornstein, David Josef. Einführung in das Hebräisch der Gegenwart, methodische Texte und Erläuterungen. (Herausgegeben durch die Zionistische Vereinigung für Deutschland). v+292 p. Berlin, Judischen Rundschau. 1927. ISIS

Bulletin de la Société d'études historiques Juives du Caire. Editeur : Librairie I. MOSCATO and Co. 6, Rue El Manakh. Première année, nº 1, 110 p. Le Caire, 1929. ISIS

Nous apprenons avec plaisir la création de cette société dont l'utilité est si évidente qu'on s'étonne de ce qu'elle n'ait pas été créée depuis longtemps. L'Egypte n'est-elle pas pour les Juifs une des contrées les plus riches en souvenirs ? Aussi faut-il espérer que beaucoup d'érudits juifs se feront membres non seulement en Egypte, mais aussi dans d'autres pays. La nouvelle société pourrait faire œuvre utile et se signaler à l'attention de la République des lettres en encourageant la publication d'une édition critique des œuvres de MAIMONIDE dans le texte arabe original. Le président de la société est JOSEPH CATTAUI pacha. Le premier numéro de son Bulletin contient les articles suivants : Communication sur les origines historiques du Ghetto du Caire, par HAÏM NAHOUM (grand rabbin du Caire); Aperçu sur la vie pastorale et agricole des Juifs d'après la Bible et le Talmud, par SAMUEL AVIGDOR; Relation d'un voyage d'études à Mehalla El Kobra, par ALFRED YALLOUZ; Histoire des Juifs en Arabie avant l'Islam, par ISRAEL WOLFENSON; Analogie des langues arabe et hébraïque, par MOURAD BEY FARAG. La cotisation annuelle est de 60 P. T. G. S.

Cowen, Philip. Prejudice against the Jew : its nature, its causes and remedies. A symposium by foremost Christians, published in *The American Hebrew*, April 4, 1890. With a foreword. 158 p. New York, Author, 520 West 122nd St., 1928. ISIS

Cross, Earl Bennett. The Hebrew family: a study in historical sociology. XV+224 p. Chicago, University Press, 1927. ISIS

Gottheil, Richard and **Worrell, William H.** Fragments from the Cairo Genizah in the Freer Collection. (*University of Michigan Studies. Humanistic Series*, volume 13). XXXI+273 p., 52 pl. New York, MACMILLAN, 1927. ISIS

Reviewed in the *Jewish Quarterly Review*, 19, 203, 1928.

Gulkowitsch, Lazar. Der Hasidismus, religionswissenschaftlich untersucht. 81 p. (*Veröff. d. Forsch.-Inst. f. vergl. Religionsgesch. an d. Univ. Leipzig*. Hrsg. v. HANS HAAS. II. Reihe, H. 6.) Leipzig, PFEIFFER, 1927. ISIS

Reviewed by HEINRICH FRICK, *Deutsche Literaturzeitung*, 6, 2378-82, 1929.

Gunkel, Hermann (1862-). What remains of the Old Testament and other essays. Translated by A. K. DALLAS. London, ALLEN and UNWIN. 1928. ISIS

Herford, Robert Travers. Judaism in the New Testament period. 256 p. London, Lindsey Press, 1928. ISIS

Holdheim, Gerhard. Palästina. Idee, Probleme, Tatsachen. 180 p. Berlin, SCHWETSCHKE, 1929. ISIS

Reviewed by K. GALLING, *Deutsche Literaturzeitung*, 6, 1977-78, 1929.

Kahle, Paul. Masoreten des Westens. Mit Beiträgen von ISRAEL RABIN. (*Texte und Untersuchgn. z. vormasoretischen Grammatik des Hebräischen*. Hrsg. v. P. KAHLE, 1) XI+155 p., 30 pl. Stuttgart, KOHLHAMMER, 1927. ISIS

Reviewed by J. BEGRICH, *Deutsche Literaturzeitung*, 5, 2495-98, 1928.

Kennett, Robert Hatch. Old Testament essays. VIII+270 p. Cambridge University Press, 1928. ISIS

Kittel, Rudolf. Geschichte des Volkes Israel. Bd. 3: Die Zeit der Wegführung nach Babel und der Aufrichtung der neuen Gemeinde. 1. Hälfte. VIII+298 p. Stuttgart, W. KOHLHAMMER, 1927. ISIS

Kittel, Rudolf. Great men and movements in Israel. Authorized translation by CHARLOTTE A. KNOCH and C. D. WRIGHT. XV + 465 p. London, WILLIAMS and NORGATE, 1929. ISIS

Kowalski, Tadeusz. Karaimische Texte im Dialekt von Troki. Ein-

geleitet, erläutert und mit einem karaimisch-polnisch-deutschen Glossar versehen. LXXIX+311 p. Cracow, Polish Academy of Science, 1929. ISIS

Reviewed by M. GASTER, *Journal of the Royal Asiatic Society*, 905-06, 1929.

Kunitz, Joshua. Russian literature and the Jew. A sociological inquiry into the nature and origin of literary patterns. VIII+195 p. New York, Columbia University Press, 1929. ISIS

Kyle, Melvin Grove. Explorations at Sodom: The story of ancient Sodom in the light of modern research. 141 p. London, R. T. S., 1928. ISIS

Lewy, Julius. Die Chronologie der Könige von Israel und Juda. 32 p. Giessen, A. TÖPELMANN, 1927. ISIS

Reviewed by W. BAUMGARTNER, *Deutsche Literaturzeitung*, 238-242, 1928.

Macalister, Robert Alexander Stewart and **Duncan, I. Garrow.** Excavations on the hill of Ophel, Jerusalem 1923. XVI+216 p., 31 pl. London, Palestine Exploration Fund, 1926. ISIS

Reviewed by K. GALLING, *Deutsche Literaturzeitung*, 5, 1965-66, 1928.

Magnus, Laurie. The Jews in the Christian era. From the first to the eighteenth century and their contribution to its civilization. 432 p. London, BENN, 1929. ISIS

Marcus, Ralph. Law in the Apocrypha. XIV+116 p. New York, Columbia University Press, 1927. ISIS

Miller, Edward Frederick. The influence of GESENIUS on Hebrew lexicography. 105 p. (*Contributions to oriental history and philology* no. 11). New York, Columbia University Press, 1927. ISIS

Neumark, David. Geschichte der jüdischen Philosophie des Mittelalters. Nach Problemen dargestellt. II. Bd., 2: Die Grundprinzipien II. 3. Buch: Attributenlehre. 2. Hälfte: Mittelalter. XX+371 p. Berlin, DE GRUYTER, 1928. ISIS

Reviewed by I. HEINEMANN, *Deutsche Literaturzeitung*, 6, 1708-13, 1929.

Petersen, William Waldemar. Das Tier im Alten Testament. Ein Beitrag zur modernen Tierschutzfrage. 83 S. Frankfurt, KAUFFMANN, 1928. ISIS

Reviewed by ZAUNICK, *Mitteilungen zur Geschichte der Medizin und der Naturwissenschaften*, 27, 327, 1928.

Pilter, William Turnbull. The Pentateuch : A historical record. As shown by the scientific investigation (chiefly archaeological and philological) of salient passages referring to the period from ABRAHAM to the Exodus. XX+647 p. London, MARSHALL, 1928. ISIS

Reviewed by A. H. S., *Journal of the Royal Asiatic Society*, 888-90, 1929.

Rappoport, Angelo S. Myth and legend of ancient Israel. With three illustrations in colour and 24 in monochrome by J. H. AMSHEWITZ. Three volumes. London, GRESHAM, 1928. ISIS

Rowley, H. H. The Aramaic of the Old Testament : a grammatical and lexical study of its relations with other early Aramaic dialects. XIV+161 p. London, MILFORD, 1929. ISIS

Reviewed by M. GASTER, *Journal of the Royal Asiatic Society*, 659-60, 1929.

Schumacher, Gottlieb (d. 1925). Der 'Adschlun. Nach den Aufzeichnungen von G. SCHUMACHER beschrieben von CARL STEUERNAGEL. XVIII+XII+764 p., 85 pl., 127 fig. Mit Anhang : Namenliste des nördl. Ostjordanlandes. XII+213 p. (S.-A. aus *Zeitschr. d. Dtsch. Palästina-Vereins* Bd. 47-49). Leipzig, HINRICHS, 1926-27.

Reviewed by ERNST SELLIN, *Deutsche Literaturzeitung*, 6, 1705-07, 1929.

Silver, Abba Hillel. A history of Messianic speculation in Israel. From the first to the seventeenth centuries. XV+268 p. New York, MACMILLAN Co., 1927. ISIS

Torrey, Charles Cutler. The second Isaiah. A new interpretation. XII+477 p. Edinburgh, CLARK, 1928. ISIS

Waite, Arthur Edward. The holy kabbalah. A study of the secret tradition in Israel as unfolded by sons of the doctrine for the benefit and consolation of the elect dispersed through the lands and ages of the greater exile. XXV+536 p., font., pl. London, WILLIAMS and NORGATE, 1929. ISIS

Wolberg, Dina. Zur differentiellen Psychologie der Juden : Experimentelle Untersuchungen an Schülern und Studenten. (*Jenaer Beitr. zur Jugend- und Erziehungspsychologie*, Band 5). 32 p. Langensalza, Verlag BELTZ, 1927. ISIS

13. — IRAN.

Dehérain, Henri. La mission de FÉLIX LAJARD en Perse (1807-1809)

et ses conséquences scientifiques. *Journal des savants*, 359-72, 401-11, 1929. ISIS

Hertel, Johannes. Beiträge zur Erklärung des Awestas und des Vedas. *Abh. sächs. Akad. Wiss.*, 40, XXIV+284 p., 1929. ISIS

Lommel, Hermann. Die Yäst's des Awesta. Übersetzt und eingeleitet. Mit Namenliste u. Sachverzeichnis. XII+211 p. (*Quellen d. Relig. gesch.* hrsg. i. A. d. Religionsgeschichtl. Komm. bei d. Ges. d. Wiss. zu Göttingen. Gruppe 6 : Iran.) Göttingen, VANDENHOECK, 1927. ISIS

Reviewed by JOHANNES HERTEL, *Deutsche Literaturzeitung*, 6, 1713-26, 1929.

Reitzenstein, Richard und **Schaeder, Hans Heinrich.** Studien zum antiken Synkretismus aus Iran und Griechenland. (*Stud. der Bibl. Warburg*, hrsg. von FR. SAXL, Bd. 7.). 355 p. Leipzig, TEUBNER, 1926. ISIS

Reviewed by MARTIN P. NILSSON, *Deutsche Literaturzeitung*, 5, 1649-1653, 1928.

14. — ISLAM.

Arnold, Sir **Thomas W.** The Islamic faith. 80 p. (*Benn's Sixpenny Library*, no. 42). London, BENN, 1928. ISIS

Arnold, Sir **Thomas W.** ; **Grohmann, Adolf.** The Islamic book. A contribution to its art and history from the seventh to the eighteenth century. 130 p., 104 pl. London, Pegasus Press, 1929. ISIS

Barazi, Mouhssine. Islamisme et socialisme. 99 p. Paris, GEUTHNER, 1929 (25 frs.). ISIS

Étude basée sur les sources arabes, anciennes et contemporaines, aussi bien que sur les écrits occidentaux. L'auteur conclut : L'Islamisme est incompatible avec le Socialisme, et se classe avec l'Individualisme économique. Il n'en a pas moins pour but l'intérêt de la Société et le bonheur de l'Humanité. »

Cash, William Wilson. The expansion of Islam. An Arab religion in the non-Arab world. With preface by D. S. MARGOLIOUTH. XVI+304 p. London, Edinburgh House Press, 1928. ISIS

Derenbourg, Hartwig. (1844-1908). Les manuscrits arabes de l'Escurial. Vol. III. Théologie, géographie, histoire. XI+330 p., 2 pl. Paris, GEUTHNER, 1929. ISIS

Gaudry, Mathéa. La femme chaouia de l'Aurès. Étude de sociologie berbère. XVI+316 p., 42 pl., 65 fig. Paris, GEUTHNER, 1929 (100 frs.). ISIS

Admirable monographie consacrée aux femmes (et subsidiairement aux hommes) de l'Aurès, un massif montagneux au sud du département de Constantine, Algérie. Ce sont des Berbères. L'Aurès fut le dernier refuge de l'indépendance berbère. La valeur d'une étude aussi consciencieuse, si grande qu'elle soit déjà, le sera encore davantage le jour où les conditions décrites auront cessé d'exister. Il n'y a pas de danger que la race de l'Aurès ne s'éteigne — il y avait plus de 126000 âmes en 1926 partagées en 12 tribus et 38 douars — mais sous l'influence combinée de l'Islam et de la France, leurs coutumes sont destinées à se modifier graduellement et peut-être à disparaître. Ce n'est qu'une question de temps. L'auteur, avocate à la Cour d'appel d'Alger, décrit minutieusement la condition matérielle de la femme depuis la naissance jusqu'à la mort, puis sa condition sociale et juridique, ses travaux domestiques, agricoles, industriels, son activité religieuse, ses rapports avec les hommes, etc. Le chapitre sur la religion contient des renseignements du plus grand intérêt sur les maraboutes, les sorcières, et les tbîbat, c.-à-d. les sages-femmes. L'ouvrage est complété par une bibliographie, un glossaire arabe-berbère, et par d'excellentes photographies fort bien reproduites. G. S.

Graham, Robert Bontine Cunninghame. Mogreb-el-Acksa: a journey in Morocco. Cheap edition. XI+300 p. London, DUCKWORTH, 1921. ISIS

First pirnted in 1898.

Hitti, Philip K. The origins of the Druze people and religion. With extracts from their sacred writings. VIII+80 p., 2 pl. (Columbia University Oriental Studies, vol. 28). New York, Columbia University Press, 1928 ($ 2). ISIS

This very elaborate study on the Druzes was written by one admirably qualified to prepare it. To quote RICHARD GOTTHEIL in the Foreword « Born in the Lebanon Mountains, Arabic is his native tongue. As a boy, and as a young man, he associated with the Druzes. He has had, and still has, access to their literature. It is likely that he knows more about them than they do about themselves. » Of all the Syrian sects Druzism is perhaps the most interesting. « It is still a living force. Its followers form to the present day a vigorous and flourishing community in the Lebanon. Its learned system has not changed since it was first inaugurated in the early part of the eleventh century. The Islam of the Near East has changed and adapted itself to the requirements of varying conditions. The Christianity of the Near East has changed. But the Druze system has been and still is the same. » The author analyzes the dogmas of Druze belief and traces them back to a great variety of sources. He concludes: « On the whole it might be said that the immediate origins of the Druze religion should be sought in the multitudinous heterodoxies of the Shî'ah and schools of thought which split early Islam asunder, and the ultimate origins in Neo-

Platonism, Gnosticism and Manichaeism. What makes its study especially interesting and valuable is the fact that while most of those systems from which the eclectic Druze founders drew their material have perished and become extinct, the Druze religion is still virile and strong and its followers are today numerous and aggressive enough to attract international attention.» Extracts from their sacred writings are given in English translation, also two facsimiles of the original texts. G. S.

Hogarth, David George (1862-1927). The life of CHARLES M. DOUGHTY. XI+216 p., pl., map. Oxford, University Press, 1928. ISIS

Ikbal Ali Shah, Sirdar. Westward to Mecca : a journey of adventure through Afghanistan, bolshevik Asia, Persia, Iraq and Hijaz to the cradle of Islam. 224 p., 12 pl. London, WITHERBY, 1928. ISIS

Reviewed by H. L. C., *Nature*, 124, 539, 1929.

(Iraq). Maps of Iraq, with notes for visitors, 1929. Eight folding maps. 34 p. Published by the government of Iraq, 1929. ISIS

Issa bey, Ahmed. Histoire des bimaristans (hôpitaux) à l'époque islamique. Comptes rendus du Congrès international des maladies tropicales, p. 81-209, Le Caire, 1929. ISIS

This elaborate study was published on the occasion of the centenary of the School of medicine of Cairo and the hospital called Qaṣr al-'Ainî after the founder AḤMAD 'ABD AL-RAḤÎM IBN MAḤMÛD AL-'AINÎ (1444-1502) of the palace in which it was established. It contains abundant information on Muslim hospitals in general, their organization, clinical teaching, dispensaries, medical service, diplomas, medical inspection, etc. Then follow notes on the hospitals of Jundîshâpûr, Egypt, Mesopotamia, Syria, Palestine, and Morocco. A great many hospitals are dealt with—eleven in Egypt, twelve in Mesopotamia, etc. Such wealth of information makes one deeply regret the lack of an index. For some hospitals a list of their physicians is added; sometimes also a list of their waqf (i.e., of the estates constituting their perpetual endowment). By far the longest notice is devoted to the Bîmâristân al-Manṣûrî (p. 121-68) which dates from the second half of the thirteenth century. It is also called the Dâr al-shifâ' (house of health) or the Bîmâristân al-Qalâ'ûn after the famous Mamlûk sultan who built it. Parts of the original buildings still exist (see plan on p. 141, and various illustrations passim). This is a very welcome contribution to the study of Muslim, and particularly of Egyptian, medicine. It is a pity that this memoir, printed in Egypt, does not give the Arabic proper names in Arabic script. For a previous study by the same author on the instruments used by Arabic physicians (Cairo, 1925) see *Isis*, 8, 597. G. S.

Legey. Essai de folklore marocain. VIII+235 p., 17 pl. Paris, P. GEUTHNER, 1926. ISIS

Reviewed by R. HARTMANN, *Deutsche Literaturzeitung*, 445-6, 1928.

Levi della Vida, G. Les « Livres des Chevaux » de HISAM IBN AL-KALBĪ et MUHAMMAD IBN AL-'ARABI. Publiés d'après le ms. de l'Escorial ar. 1705. 195 p., 3 pl. (*Publications de la Fondation « De Goeje »*, no. 8). Leyden, BRILL, 1928. ISIS

Loria, Gino. Ce que nous apprirent et ce que nous attendons des manuscrits arabes relatifs aux mathématiques *Archeion*, 11, 15-22, 1929. ISIS

Communication faite au 1er Congrès international d'histoire des sciences, Paris, 20-24 mai, 1929.

Marçais, Georges. Manuel d'art musulman. L'architecture. Tunisie, Algérie, Maroc, Espagne, Sicile. 967 p., 506 fig. Paris, PICARD, 1926. ISIS

Reviewed by STÉPHANE GSELL, *Journal des savants*, 209-220, 1928.

Marçais, Georges. Les faïences à reflets métalliques de la grande mosquée de Kairouan. 41 p., 26 pl. (*Contrib. à l'étude de la céramique musulmane*. IV.) Paris, GEUTHNER, 1928. ISIS

Reviewed by FRIEDRICH SARRE, *Deutsche Literaturzeitung*, 6, 1680-1682, 1929.

Meyerhof, Max. Die Anfänge der arabischen Ophthalmologie. 7 p. Anvers, De Vlijt, 1929. ISIS

Nau, F. De quelques sources arabes de la scolastique d'après une publication récente. *Revue de philosophie*, 29, 424-30, 1929. ISIS

A propos de l'ouvrage de MIGUEL ASÍN PALACIOS « El justo medio en la creancia, compendio de teologia dogmatica de ALGAZEL » (*Isis*, 13, 420).

Ruska, Julius. Leitsätze für den Katalog der arabischen Alchemisten. *Archeion*, 11, 29, 1929. ISIS

Communication faite au 1er Congrès international d'histoire des sciences, Paris, 20-24 mai, 1929.

Ruska, Julius. Die Turba philosophorum. Ein Grundwerk der Alchemie des Mittelalters. *Forschungen und Fortschritte*, 6, Nr. 1, 4-5, Berlin, 1930. ISIS

« Da der Verfasser den HERAKLIOS unter die Redner aufgenommen hat, kann die 'Turba' kaum vor dem Anfang des 8. Jahrhunderts verfasst sein. Ist sie von Haus aus griechisch geschrieben oder hat sie einen arabischen Alchemisten zum Verfasser? Es lässt sich mit zwingenden Gründen erweisen, dass die lateinische 'Turba' aus dem Arabischen übersetzt ist.

Die sprachliche Form verrät dem Kundigen auf Schritt und Tritt den Uebersetzungscharakter. Die bis zur Unkenntlichkeit entstellten Philosophennamen lassen sich in zahlreichen Fällen wiederherstellen, wenn man die älteste lateinische Form in arabische Schrift ohne Vokale und diakritische Punkte umsetzt und daraus die griechischen Namen herstellt. So wird ARISLEUS zu ARCHELAOS, IXIMIDRUS zu ANAXIMANDROS, LUCAS zu LEUKIPPOS, PANDOLFUS zu EMPEDOKLES, MUNDUS und MENABDUS zu PARMENIDES, ACSUBOFES zu XENOPHANES. Aehnlich gelingt es, griechische oder arabische Stoffnamen wiederherzustellen, die in der lateinischen Fassung unverständlich geworden sind. Und wer sich von diesen Beweisen nicht überzeugen lassen wollte, dem wird die Entdeckung dreier Turbareden in arabischer Sprache und die in arabischen Schriften vorkommende Erwähnung der 'Versammlung des PYTHAGORAS' die Richtigkeit der These beweisen. Viel schwieriger ist die Frage nach dem Ursprung der arabischen Turba, denn zwischen dem Niedergang der griechischen und dem plötzlichen Auftauchen einer eigenartigen arabischen Alchemie liegen völlig dunkle Jahrhunderte. Da jede griechische Überlieferung über diesen Zeitraum der Alchemiegeschichte fehlt, müssen wir aus dem Studium der ältesten arabischen Autoren den Stand der Dinge zu rekonstruieren suchen. Ob man den Ursprung der 'Turba' in die Zeit zwischen dem 8. und 10. Jahrhundert versetzen muss, ob sie ursprünglich griechisch war, oder ob sie ein relativ spätes Erzeugnis arabischer Herkunft ist, wird sich erst sicher entscheiden lassen, wenn die Geschichte der Chemie durch kritische Ausgaben der griechischen, arabischen und lateinischen Autoren eine feste Grundlage gewonnen hat.»

Rutter, Eldon. The Arabians. *Journal of the Royal Asiatic Society*, 952-55, 1929. ISIS

Sell, Edward. Studies in Islam. 266 p. Madrid, 1928. ISIS

Reviewed by HADI HASAN, *Journal of the Royal Asiatic Society*, 899, 1929.

Sharaf, Mohammad. An English-Arabic dictionary of medicine, biology, and allied sciences. (Based upon recent scientific literature). Including the terms used in medicine, anatomy, physiology, surgery, obstetrics, gynecology, materia medica, pathology, dermatology, ophthalmology, pediatrics, legal medicine, neurology, histology, toxicology, climatology, etc., etc., and the various sciences closely related to medicine, botany, zoology, chemistry, physics, bacteriology, parasitology, hygiene, electricity, pharmacy, etc. XXI+971+XII+42 p. Second edition thoroughly revised (Ministry of education, Egypt). Government Press, Cairo, 1928. To be obtained from the author, 1, Sharia Mazlûm Pasha, Cairo, or from H. FRIEDRICH and Co., Sharia El-Maghrabi, Cairo (P. T. 150). ISIS

This is a very elaborate dictionary which will facilitate the translation of the most technical treatises from English (and indirectly from other languages) into Arabic. The author has taken into account the very rich scientific literature already available in Arabic and adapted its terminology to modern

needs. There is a long Arabic preface (42 p.) and 12 p. of errata and addenda.
G. S.

Sidersky, D. Les origines des légendes musulmanes dans le Coran et dans les vies des prophètes. 230 p., Paris, GEUTHNER, 1929.
ISIS

Storey, C. A. Persian literature, a biobibliographical survey. Section I : Qur'ânic literature. XXIII+58 p. London, LUZAC, 1927. ISIS
Reviewed by R. A. NICHOLSON, *Journal Royal Asiatic Society*, 441-43, 1928.

Vissière, A. Ouvrages chinois pour l'étude de l'arabe. *Revue des Etudes islamiques*, 339, 1929. ISIS

Wiedemann, Eilhard. Über arabische astronomische Instrumente. (Beiträge zur Geschichte der Naturwissenschaften, 76). *Sitzungsber. der Physikalisch-medizinischen Soz. zu Erlangen*, 58, 380, 1928.
ISIS

Brief note of no importance. References to AL-'URḌÎ (q.v., *Isis*, 13, 111-13) and AL-'ÂMILÎ. G. S.

Wiedemann, Eilhard. Über die Milchstrasse bei den Arabern. (Beiträge zur Geschichte der Naturwissenschaften, 74). *Sitzungsber. der Physikalisch-medizinischen Soz. zu Erlangen*, 58, 348-62, 1928.
ISIS

Muslim descriptions of, ideas on, and poetical allusions to the milky way. G. S.

PART III

SYSTEMATIC CLASSIFICATION.

Including only the material which could not be included in Parts I and II. Hence studies on Japanese astronomy or on XIIth century astronomy are not classified below under astronomy, but above, respectively under Japan (in Part II) and XIIth Century (in Part I).

The sections forming Part III are classified as follows :

I. *Science in general* : 15. Bibliography; 16. History; 17. Organization; 18. Philosophy.

II. *Formal sciences* (Knowledge of forms) : 19. Logic and Theory of Knowledge; 20. Mathematics; 21. Statistical methods.

III. *Physical sciences* (Knowledge of inorganic nature) : 22. Mechanics; 23. Astronomy; 24. Physics; 25. Chemistry (Physico-chemistry, Industrial chemistry); 26. Technology.

IV. *Biological sciences* (Knowledge of organic nature) : 27. Biology (Gene-

ralities, « Natural history »); 28. Botany (Agronomy, Phytopathology, Palaeobotany); 29. Zoology.

V. *Sciences of the earth* (implying knowledge of both organic and inorganic nature): 30. Geodesy; 31. Geography and Oceanography; 32. Geology, Mineralogy, Palaeontology, Mining; 33. Meteorology, Climatology and Terrestrial Physics.

VI. *Anthropological and historical sciences* (Knowledge of man, past and present): 34. Anatomy; 35. Physical anthropology (anthropometry and races of man); 36. Physiology (human and comparative); 37. Psychology (human and comparative); 38. Archaeology (generalities, methods); 39. Prehistory; 40. Ethnology (primitive and popular science); 41. Superstition and Occultism.

42. Economics (economic doctrines and history; commerce; transportation and communications); 43. Sociology, Jurisprudence and Positive polity ; 44. History of civilization (general history, historical methods, biography and chronology); 45. History of art (Art and science ; Iconography; Arts and crafts) ; 46. History of language, writing and literature ; 47. History of morals (Moral organization of society); 48. History of philosophy ; 49. History of religion (Science and religion).

VII. *Medicine*: 50. History, organization and philosophy of medicine; 51. Epidemiology, History of special diseases. Public health and Social medicine; 52. History of hospitals and of medical teaching; 53. Pharmacy; Pharmacology; Toxicology.

VIII. *Education* (the methods of accumulating, imparting and diffusing knowledge); 54. Education (Generalities, Methods, Colleges, Universities); 55. Academies, societies, congresses, National and international organization of science; 56. Bibliography. (Methods, Libraries); 57. Museology (Museums and Collections).

IX. 58. Alia; 59. Errata.

The applied sciences are not disconnected from the pure sciences, but, as far as possible, the principles and applications of science are considered in the same section. However, applications based upon the principles of many sciences are dealt with separately (ex. technology; medicine; education).

I. — SCIENCE IN GENERAL

16. — HISTORY OF SCIENCE.

Bloch, M. Über wissenschaftliches Schaffen. Schluss-Vortrag auf dem Physiker-Kongress in Leningrad. *J. d. Russ. Phys.-Chem. Ges. Abt. Phys.*, VII (1925), no. 1-2, 179-205 (Russ.). ISIS

Der Vortrag summiert die mehrjährigen Arbeiten des Verfassers. Er unterscheidet Analyse, Psychologie und Geschichte des Schaffens. Der Aufsatz enthält eine grosse Reihe von historisch-chem. u. phys. Daten aus dem Leben u. Schaffen hervorragender Naturforscher. M. B.

Dultz and Co. CURT BRUMME. Bibliotheca historico naturalis et

medicina. Autores veteres ab CAESALPINUS usque ad DARWIN. Ex Bibliotheca Zollikoferiana. Cum praefatione HUGO DINGLER Universitatis Monachiae, Catalogus LXXVII. 60 p. München, 1929. ISIS

Metzger, Hélène. La philosophie d'EMILE MEYERSON et l'histoire des sciences. *Archeion*, 11, XXXII-XLIII, 1929. ISIS

Communication faite au 1er Congrès international d'histoire des sciences, Paris, 20-24 mai, 1929.

Sarton, George. Introduction to the History of Science. Vol. I, From HOMER to OMAR KHAYYAM. XII+840 p. Washington, D. C. Carnegie Institution, ($ 10); London, BAILLIERE, TINDALL, and COX, 1927 (45 sh.). ISIS

Reviewed by ANGEL GONZALEZ PALENCIA in *El Debate* (Madrid, Jan. 28, 1930); by DUNCAN B. MACDONALD, *Speculum*, 486-92, 1929; by M. PLESSNER in *Orientalistische Literaturzeitung*, vol. 32, 630-32, 1929; and by PAUL TESDORPF in the *Münchener medizinische Wochenschrift* (Nr. 2, p. 74, 1930).

17. — ORGANIZATION OF SCIENCE.

(Internal organization is meant, see Isis 1, 195. *For external organization, national or international, see section* 55).

Picard, Jacques. Essai sur les conditions positives de l'invention dans les sciences (*Biblioth. de philosophie contemporaine*), 324 p., Paris, ALCAN, 1928. ISIS

Thèse de doctorat ès-lettres où l'auteur essaie de déterminer les conditions de la découverte dans les sciences. Il considère successivement « les conditions internes du développement des sciences », c'est-à-dire l'état de la science au moment où le savant poursuit sa recherche, « les conditions sociales du progrès scientifique » (influence de la race, du milieu social et des besoins sociaux), « les conditions psychologiques de la découverte » (génie, puissance d'attention, esprit d'observation, etc.), et enfin « le rôle du hasard dans la découverte et l'invention scientifiques ». L'ouvrage se termine par l'esquisse d'une technique de l'invention qui lui est occasion de proposer quelques réformes de nature à favoriser le travail des inventeurs, et en premier une réforme de l'enseignement des sciences au lycée. — Ce travail de JACQUES PICARD est complété par un « Essai sur la logique de l'invention dans les sciences » (289 p.), paru à la même occasion, dans la même collection, mais que je n'ai pas eu entre les mains. L. G.

Vogt, Oskar. Die Naturwissenschaft in der Sowjet-Union: Vorträge ihrer Vertreter während der « Russischen Naturforscherwoche » in Berlin 1927. Herausgegeben im Auftrage der Deutschen Gesellschaft zum Studium Osteuropas. VIII+352 p. Berlin, Ost-Europa Verlag, 1929. ISIS

Westaway, Frederick William. Science teaching: what it was, what it is, what it might be. XXII+442 p. London, BLACKIE, 1929. ISIS

Reviewed by E. J. HOLMYARD, *Nature*, 124, 436-7, 1929.

18. — PHILOSOPHY OF SCIENCE.

Franklin, Wm. S. Indeterminism in the physical world. *Proceedings of the American Academy of Arts and Sciences*, 60, 485-502, 1925. ISIS

« Is everything in this world of ours completely determined by antecedent conditions, and is there no such thing in nature as an essentially unpredictable occurence? Is every choice, every decision, of our lives determined by a definitely unbalanced condition among all of the influences which weigh for and against the choice or decision, and is there no such thing as essential freedom of the will and therefore no such thing as moral responsibility among men? » « Of course Gesetzmässigkeit is a fact, otherwise there could be no such thing as science, but it may not be of universal validity; a complete philosophy of nature may have to contemplate something beyond Gesetzmässigkeit, something essentially unpredictable, lawless. At any rate it is the purpose of this essay to make this general point of view thinkable. »

Jeans, Sir James. The universe around us. X+352 p., 24 pl. Cambridge, University Press, 1929. ISIS

Reviewed by R. A. S., *Nature*, 124, 903-05, 1929.

Lamouche, André. Essai sur la méthode des sciences. *Revue philosophique*, 54, 48-104, 1929. ISIS

Singer, Charles. Scientific humanism. *The Realist*, 1, 12-18, 1929. ISIS

II. — FORMAL SCIENCES
(Knowledge of forms)

20. — MATHEMATICS.

Allen, Edward S. Periodicals for mathematicians. *Science*, 70, 592-94. ISIS

Brouwer, L. E. J. Mathematik, Wissenschaft und Sprache. *Monatshefte für Mathematik und Physik*, 36, 153-64, 1929. ISIS

Cajori, Florian. Generalizations in geometry as seen in the history of developable surfaces. *American Mathematical Monthly*, 36, 431-37, 1 fig., 1929. ISIS

« ' The mathematicians of the eighteenth century would have been astonished to a high degree, had they been told that there exist developable surfaces which are not ruled surfaces. ' Perhaps this passage from the pen of PICARD surprises many mathematicians even of the present time; it challenges the historian to endeavor to trace the evolution of ideas. The result alluded to is no less surprising to us than was to EULER in the eighteenth century the fact that i^i where $i = \sqrt{-1}$ has a real value. In a letter to GOLDBACH, EULER showed his interest by computing this value to ten decimal places. PICARD's statement is no less surprising than the declaration about integral numbers made by GALILEO in the seventeenth century: ' Neither is the number of squares less than the totality of all numbers, nor the latter greater than the former. ' »

Geppert, Harald. Sulle costruzioni geometriche che si eseguiscono colla riga ed un compasso ad apertura fissa. *Periodoco di matem.*, 9, 292-319, 1929. ISIS

Constructions d'ABU'L WAFÂ, ALBERT DURER, LEONARDO DA VINCI, LODOVICO FERRARI, CARDANO, GIOV. BENEDETTI, TARTAGLIA. L. G.

Karpinski, Louis C. Mathematics and the progress of science. *School Science and Mathematics*, 29, 126-32, 1929. ISIS

Karpinski, Louis C. Recent progress in the history of ancient mathematics. *Science*, 70, 622-24, 1929. ISIS

Keyser, Cassius Jackson. The pastures of wonder: the realm of mathematics and realm of science. XII+208 p. New York, Columbia University Press, 1929. ISIS

Loria, Gino. Curve piane speciali algebriche e trascendenti. Teoria e storia. Volume 1. Curve algebriche con 122 figure illustrative intercalate nel testo. Prima edizione italiana. XVI+574 p. Milano, ULRICO HOEPLI, 1930 (L. 75). ISIS

LORIA's treatise on special curves is already so well known in its German form (2nd ed., 2 vols., Leipzig, 1910-11), that it will suffice to announce the publication of this Italian edition which will be most welcome to many. This first volume, massive as it is, deals only with algebraic curves. It is divided into five books of which the first three are devoted respectively to curves of the second, third, and fourth order; book four deals with curves of which the order is superior to four; the last book deals with curves of any order, e.g., paraboles or hyperboles of any order, LAMÉ's curves, etc. The treatment of each curve is as full as one could wish from the mathematical point of view, and all available historical information is given. The author, who is not simply a great mathematician but a great historian of mathematics was well qualified to do this, and one may feel secure under his guidance. Moreover, abundant bibliographical references will make it easy to return to the very sources. It is a real encyclopaedia of this very vast and intricate

subject, the investigation of which implied the consideration of a large part of the mathematical literature from the Greeks down to our own days. May I recall that the author has published previously a treatise on twisted curves (curves of variable curvature), curve sghembe speciali algebriche e trascendenti (Bologna, ZANICHELLI, 1925). A great work which deserves every success. G. S.

Rome, A. Histoire des mathématiques. *Revue des Questions scientifiques*, 250-75, 1929. ISIS

1. Les Grecs et l'Orient; 2. Sur l'origine de nos chiffres; 3. PLATON mathématicien.

Vetter, Q. O metodyce historji matematyki. 19 p. *Obditka z Wiadomosci Matematycznych*, 30-31, Warszawa, 1929. ISIS

Vetter, Q. Nektera « rara mathematica » v prazskych knihovnach. 35 p., 6 fig. Zvlastni otisk ze sborniku prirodovedeckého, 6, 1929. ISIS

« L'auteur donne une description bibliographique de quelques livres mathématiques et notamment arithmétiques, dont les premières éditions datent de l'époque avant 1603 et qui se trouvent dans la bibliothèque de l'Université ou celle du couvent de Strahov ou enfin dans la bibliothèque de l'Union des mathématiciens et physiciens tchécoslovaques à Prague. Il a pris pour base le livre de D. E. SMITH « Rara arithmetica » complété par les matériaux de Prague. » 133 ouvrages sont décrits, et un index des auteurs permet de s'y retrouver facilement. G. S.

Vetter, Quido. Quelques remarques sur l'histoire des mathématiques dans les bibliothèques de Prague. *Archeion*, 11, LIII-LVIII, 1929. ISIS

Communication faite au 1er Congrès international d'histoire des sciences, Paris, 20-24 mai, 1929.

Windred, G. History of the theory of imaginary and complex quantities. *The Mathematical Gazette*, 14, 533-41, 1929. ISIS

21. — STATISTICS.

(History and methods. Tables and generalities. For the applications, refer to the sciences to which they are applied)

Mises, Richard von. Wahrscheinlichkeit, Statistik und Wahrheit. VII+189 p. (*Schriften z. wissenschaftl. Weltauffassung*. Hrsg. v. PHIL. FRANK u. MORITZ SCHLICK. Bd. 3.) Wien, SPRINGER, 1928. ISIS

Reviewed by PAUL FLASKÄMPER, *Deutsche Literaturzeitung*, 6, 1741-46, 1929

III. — PHYSICAL SCIENCES
(Knowledge of inorganic nature)

22. — MECHANICS.
(*Including celestial and atomical mechanics*)

Donder, Théophile de. Au-delà de la relativité. 14 p. *Le Flambeau* Bruxelles, juillet, 1929. ISIS

Prunier, F. NEWTON, MAUPERTUIS et EINSTEIN : réflexions à propos de la relativité. 80 p. Paris, BLANCHARD, 1929. ISIS

23. — ASTRONOMY.

Barrell, Joseph. On continental fragmentation and the geologic bearing of the moon's surficial features. *Annual report of the Smithsonian Institution for* 1928, p. 283-306, 3 pl., Washington, 1929. ISIS

Reprinted, by permission, from *American Journal of Science*, 13, no. 76, April, 1927.

(Calendar reform). Report of the National Committee on Calendar Simplification for the United States, submitted to the Secretary of State, Washington, August 1929. 119 p. Rochester, N. Y., National Committee on Calendar Simplification, 1929. ISIS

Reviewed by H. C. P., *Nature*, 124, 977-78, 1929.

Fotheringham, J. K. The longitude of the Moon from 1627 to 1918. *Monthly Notices of the Royal Astron. Soc.*, 80, 289-307, 1919-20. ISIS

Fotheringham, J. K. The Metonic and Callippic cycles. *Monthly Notices of the Royal Astron. Soc.*, 84, 383-92, 1923-24. ISIS

Fotheringham, John K. Trepidation. *Monthly Notices of the Royal Astron. Soc.*, 87, p. 142-167 and 182-196, 1926-27. ISIS

« I therefore propose to use the term « trepidation », which expresses the kind of movement that we have in view, and which has the advantage of being the ancient term for one of the forms in which it manifests itself. The trepidation of the equinoxes, in which some Greek and most mediaeval astronomers believed, was a long-period forward and backward motion of the equinox, changing rather by jerks than with the curvature that characterises most changes of celestial motions. Such a motion of the equinox with a major period of 260 years is exactly one of the phenomena under discussion, and I propose therefore to give the name « trepidation » to the whole of this

group of phenomena, just as we give the name « precession » not only to the secular motion of the equinox itself, but to all apparent motions arising from the secular changes in the relative positions of the poles of the Earth's rotation and revolution ».

Jeans, Sir **James**. The universe around us. x+352 p., 24 pl. Cambridge, University Press, 1929. ISIS

Pease, F. G. Astronomical telescopes. *Annual report of the Smithsonian Institution for* 1928, p. 201-11, 7 pl., Washington, 1929. ISIS

A lecture delivered on Dec. 15, 1927, at the Public Library, Los Angeles, under the auspices of the Astronomical Society of the Pacific. Reprinted by permission, with additional illustrations, from the *Publications of the Astronomical Society of the Pacific*, 40, no. 233, February, 1928.

Stroobant, Paul. Sur l'agrandissement apparent des constellations, du soleil et de la lune à l'horizon. (Troisième note). *Acad. Royale de Belgique, Bulletin de la Classe des Sciences*, 14, 91-108, 1928. ISIS

« L'agrandissement apparent des astres à l'horizon était connu des Anciens; ARISTOTE et PTOLÉMÉE, notamment, en font mention. Il a été étudié par l'astronome arabe ALHAZEN, au XI^e^ siècle et par un grand nombre d'astronomes, de physiciens et de philosophes, depuis le XVII^e^ siècle jusqu'à l'époque actuelle. La cause de ce phénomène n'est ni astronomique ni physique. » Conclusions : « 1. Il existe une diminution de la grandeur apparente d'un objet qui passe de la direction horizontale à la direction zénithale; si l'on représente par 100 le diamètre à l'horizon, on trouve qu'au zénith il a des valeurs moyennes comprises entre 87 et 79, suivant les conditions d'observation. 2. Cette variation ne semble pas augmenter avec la distance de l'objet à l'œil de l'observateur. 3. Elle est plus accentuée pour les personnes qui n'ont pas l'habitude de l'estimation des grandeurs apparentes, que pour les astronomes. 4. Les écarts entre les estimations faites par les divers observateurs ont semblé persister au cours des expériences, les uns trouvant presque toujours un agrandissement supérieur à la moyenne et les autres un agrandissement moins marqué; ce qui montre l'existence d'une véritable équation personnelle. 5. La variation de grandeur angulaire devient très faible à une petite hauteur au-dessus de l'horizon; à 45° de hauteur cette grandeur est sensiblement la même qu'au zénith. 6. Le changement de grandeur apparente se manifeste aussi bien en pleine obscurité que dans une salle éclairée, ce qui montre que cette variation doit avoir une cause physiologique. 7. A cette cause physiologique semble s'ajouter une influence d'ordre psychologique dont la nature n'est pas encore définie avec certitude. »

Turner, H. H. On an unsuccessful search for the 9.2-year magnetic period in sunspot records, with a new analysis of those records back to 1610. *Monthly Notices of the Royal Astron. Soc.*, 86, 119-30, 1925-26. ISIS

On p. 122 is reproduced WOLFER's table of sunspot maxima and minima

of the last three centuries; the original table appeared in the *Vierteljahrsschrift der Naturforschenden Gesellschaft* in Zürich, 47, 240, 1902, A. P.

24. — PHYSICS.

Bridgman, Percy Williams. Permanent elements in the flux of present-day physics. *Science*, 71, 19-23, 1930. ISIS

Address of the retiring vice-president and chairman of Section B — Physics, American Association for the Advancement of Science, Des Moines, Iowa, December, 1929.

Broglie, L. de. Déterminisme et causalité dans la physique contemporaine. *Revue de Métaphysique et de Morale*, 36, 433-43, octobre-décembre, 1929. ISIS

Cajori, Florian. A history of physics in its elementary branches: including the evolution of physical laboratories. Revised and enlarged edition. XIII+424 p. New York, MACMILLAN, 1929. ISIS

Feigl, Herbert. Theorie und Erfahrung in der Physik. IV+142 p. (*Wissen und Wirken*, Bd. 58). Karlsruhe, BRAUN, 1929. (Rm. 4). ISIS

Après un coup d'œil sur les fondements généraux des théories physiques, l'auteur fait une revue rapide des principales théories qui marquent le développement de la physique depuis COPERNIC, en passant par NEWTON, les théories de l'émission et de l'ondulation de la lumière, celles auxquelles ont donné lieu l'étude de la chaleur, de l'électricité, la théorie électronique, le principe de relativité et la théorie des quanta jusqu'à la mécanique ondulatoire. La dernière partie traite du sens et de la valeur des théories physiques.
L. G.

Lodge, Sir Oliver. States of mind which make and miss discoveries: with some ideas about metals. Nineteenth May lecture to the Institute of Metals, delivered May 7, 1929. (Reprinted from the *Journal of the Institute of Metals*, vol. 41, no. 1, p. 345-76), London, Institute of Metals, 1929. ISIS

Planck, Max. Das Weltbild der neuen Physik. *Monatshefte für Mathematik und Physik*, 36, 387-410, 1929. ISIS

Volkringer, H. Les étapes de la physique. IX+217 p. Préface de CH. FABRY. (Encyclopédie GAUTHIER-VILLARS). Paris, GAUTHIER-VILLARS, 1929. ISIS

25. — CHEMISTRY, PHYSICO-CHEMISTRY, INDUSTRIAL CHEMISTRY.

Bloch, M. Chemiker-Akademiker. *Priroda*, no. 7-9, 205-14, 1925. (Russ.) ISIS

Der Aufsatz ist anlässlich des 200-jährigen Jubiläums der Akademie der Wissenschaften geschrieben und schildert die Rolle der Akademie der Wissenschaften in der Entwicklung der russischen Chemie. In chronologischer Reihenfolge finden sämtliche Chemiker-Akademiker Erwähnung, nebst Angabe ihrer wichtigsten Arbeiten. Eingehender werden CHR. E. HELLERT, LOMONOSSOW, E. LAXMANN, GEORGI SACHAROW, T. LOWITZ, K. G. KIRCHOFF, G. HESS, J. FRITZSCHE, N. ZININ, A. BUTLEROW, N. BEKETOW erwähnt. M. B.

Bloch, M. Wege der Entwicklung der Chemie. In dem Sammelwerk : Wissenschaft u. Technik in USSR, SA. 14 p. 1928. (Russ.). ISIS

Verfasser zeichnet die Entwicklungslinien der Chemie des 20. Jahrhunderts und schildert insbesondere den Anteil der russischen Chemiker an dieser Entwicklung. M. B.

Bloch, M. Die Wege der modernen Chemie. *Priroda*, no. 4-6, p. 97-102, 1925 ; no. 1-6, p. 74-76, 1923. (Russ.). ISIS

Eine theoretische Betrachtung auf historischer Basis. M. B.

Bugge, Günther. Das Buch der grossen Chemiker. Unter Mitwirkung namhafter Gelehrter hrsg. von GÜNTHER BUGGE. Bd. 1 : Von ZOSIMOS bis SCHÖNBEIN. XII+496 p., 62 fig. Berlin, Verlag Chemie, 1929. ISIS

Chemnitius, Fritz. Die Chemie in Jena von ROLFINCK bis KNORR (1629 bis 1921). 192 p., 13 fig., Jena, BIEDERMANN, 1929. ISIS

Lippmann, Edmund O. von. Zur Geschichte des Alkohols und der Bezeichnung Gas. 4 p. *Chemiker-Zeitung*, Nr. 90, 1929. ISIS

26. — TECHNOLOGY.

(*For mining, see* 32. *geology* ; *for industrial chemistry*, 25. *chemistry. See also Arts and crafts under* 45)

Baer, Joseph and Co. Aeronautik, Flug- und Luftschiffahrt in Wort und Bild. Meteorologie. (Lagerkatalog 758). 21 p. Frankfurt am Main, 1929. ISIS

Erhard, L. Der Weg des Geistes in der Technik. IV+30 p., 55 Abb.,

2 Übersichtstafeln. (*Deutsches Museum, Abhandlungen und Berichte*, 1, Heft 4). Berlin, VDI-Verlag, 1929 (1. Rm.) ISIS

Die Gesetzmässigkeit in der Entwicklung der organischen Welt lässt sich auch in der Entwicklung der Technik erkennen : Vom primitiven Werkzeug zur immer zweckvoller gestalteten Maschine führt das Bestreben des Menschen, sich naturgegebene Gebilde und Kräfte untertan zu machen. Die vorliegende Schrift zeigt kurz die innere Verwandtschaft zwischen der biologischen und technischen Entwicklung, deren Gang sie an Hand gemeinfasslicher Bilderreihen veranschaulicht.

Feldhaus, Franz Maria. Die Geschichte der Technik, eine neue historische Hilfswissenschaft : Inhalt, gegenwärtiger Stand und Aufgaben. *Archeion*, 11, X-XIII, 1929. ISIS

Communication faite au 1er Congrès international d'histoire des sciences, Paris, 20-24 mai, 1929.

Hassler, Friedrich. Die technisch-geschichtlichen Arbeiten des Vereines deutscher Ingenieure. *Archiv für Geschichte der Mathematik, der Naturwissenschaften und der Technik*, 12, 188-94, 1929. ISIS

Howgrave-Graham, R. P. Some clocks and jacks, with notes on the history of horology. *Archaeologia*, 77, 257-312, 10 pl., 4 fig., 1928. ISIS

Conclusions : 1. « The existence of escapement clocks in Europe prior to the early part of the fourteenth century is doubtful, the first reasonably satisfying references being in DANTE's Paradiso, 1318-21, and in FIAMMA's account of a public clock at Milan in 1335 (see BAILLIE). 2. Mr. G. H. BAILLIE's investigations seem to indicate roughly a progression of public escapement clocks across the Continent between c. 1336 and c. 1371. 3. No certain evidence has reached me as to the nature of the horologes on the Continent before c. 1318, nor as to those in England before c. 1368. They may have been clepsydrae. 4. A cluster of records appearing first (so far as I have yet ascertained) at Exeter in 1284 suggests the rise of a new invention or the sudden popularity of some existing device at the end of the thirteenth century. The St. Paul's deed and the St. Albans records give some support to the theory that genuine clocks were known in the thirteenth century. We must not yet dismiss the possibility that the escapement was actually an English invention of the thirteenth century, though it seems unlikely. 5. Certain of the earlier horologes, which appear to have been magnificent and elaborate, may have been clepsydrae, and the transition to weightdrive may have been gradual, but the origin of the escapement remains obscure. 6. The functions of clocks were gradually increased and made more complex probably in the order already given. 7. The escapement clock may have appeared in England simultaneously with the importation of three Dutch horologers in 1368 and the appearance of the word ' clock ' almost immediately afterwards supports this view, but see 4 above. 8. In my opinion only the Dover Castle, the ' Webster ', and the Peterborough clocks leave room

for any belief that there is any fragment of a clock in this country which is earlier than c. 1390, and these contain no feature that definitely supports the claim; they merely remain doubtfully challenged because of their lack of evidential features. 9. Of the other important existing examples, the oldest and finest is that at Wells (c. 1392). Next in order are probably Exeter, partly fifteenth century; Ottery, perhaps sixteenth century with one or two earlier wheels; and Wimborne, the last being, in the main, late sixteenth century and after. 10. Wells probably has the oldest jack and the oldest pair of quarter-jacks. 11. The mechanical details formerly considered to be guides to antiquity are almost all valueless, though architectural detail in ironwork is of high importance. 12. The presence of screws and nuts precludes a date prior to c. 1460, and is generally a sign of sixteenth-century or later workmanship. »

Slater, Ernest. PITMAN'S technical dictionary of engineering and industrial science in seven languages—English, French, Spanish, Italian, Portuguese, Russian and German. In collaboration principally with E. LEBRETON, F. P. VERHAEGHE, R. COBB, DAGNINO MALTES, F. MARTINHO, A. LEVINE, H. LEDWARD and H. A. MACHEN. In 4 volumes. Vol. 1: A-Dec. x+581 p. Vol. 2. Dec.-Knu. III+p. 582-1155. Vol. 3. Lab—Rib. III+p. 1156-1727. Vol. 4: Rib—Zon. III+p. 1728-2211. London, PITMAN, 1929. ISIS

IV. — BIOLOGICAL SCIENCES
(Knowledge of organic nature)

27. — BIOLOGY (*generalities*, « *natural history* »).

Castigliano, Arturo. La concezione biologica nel Rinascimento italiano. *Minerva Medica*, Anno IX, vol. II, n. 42, 20 p., 1929. ISIS

Henderson, I. F.; Henderson, W. D. A dictionary of scientific terms, pronunciation, derivation, and definition of terms in biology, botany, zoology, anatomy, cytology, embryology, physiology. Second edition revised. 364 p. Edinburgh, OLIVER and BOYD, 1929. ISIS

Hofsten, Nils von. Zur älteren Geschichte des Diskontinuitätsproblems in der Biogeographie. *Zoologische Annalen*, 7, 197-353, 1916. ISIS

Contents: 1. Das Diskontinuitätsproblem; 2. Die Tier- und Pflanzengeographie im Altertum; 3. Die Antipodenfrage im Altertum und Mittelalter; 4. AUGUSTINUS und das Problem der Inselfauna; 5. Der irländische AUGUSTINUS; 6. Die Entdeckung Amerikas — ein Wendepunkt in der Geschichte des Diskontinuitätsproblems; 7. Einzelbeobachtungen über Inseltiere im 17. und 18. Jahrhundert; 8. BUFFON; 9. Die Pflanzengeographie im 18. Jahrhundert; 10. ZIMMERMANN; 11. Die Tiergeographie am Ende des 18. Jahrhundert;

12. Salonwissenschaft und zoologische Dilettanten am Ende des 18. Jahrhunderts; 13. Die Pflanzen- und Tiergeographie im Anfang des 19. Jahrhunderts; 14. Der anthropologische Polygenismus; 15. LOUIS AGASSIZ; 16. EDWARD FORBES; 17. Das Jahrzehnt vor DARWIN; 18. « Die miozäne Atlantis »; 19. WALLACE 1855; 20. DARWIN; 21. Die Jahre nach DARWIN; 22. Ein modernes Problem : die Frage nach der polytopen Artentstehung; 23. Schlusswort.

Macphail, Sir Andrew. Evolution and life. *Annals of medical history*, 1, 553-61, 1929. ISIS

Plate, Ludwig. Vitalismus und Mechanismus in einer neuen biologischen Auffassung. *Scientia*, 46, 13-20, 1929; trad. française, suppl., 1-8. ISIS

A propos de l'ouvrage de E. RIGNANO : Das Leben in finaler Auffassung (*Isis*, 11, 534) (*Vide infra*, RIGNANO, E.).

Rignano, Eugenio. Nè vitalismo nè mecanismo. Replica al Prof. PLATE. *Scientia*, 46, 21-24, 1929; trad. française, suppl.; 9-20 (*Vide supra*, PLATE, L.). ISIS

28. — BOTANY.

(*Agronomy, phytopathology, palaeobotany*)

Coupin, Henri. Coup d'œil sur l'histoire de la botanique française. *Revue scientif.*, 449-57, août 1929. ISIS

Simple énumération de noms de botanistes.

Hill, A. W. Index Kewensis plantarum phanerogamarum. Supplementum septimum nomina et synonyma omnium generum et specierum ab initio anni MDCCCCXXI usque ad finem anni MDCCCCXXV nonnulla etiam antea edita complectens. Ductu et consilio A. W. HILL. Confecerunt Herbarii Horti Regii Botanici Kewensis Curatores. III+260 p. Oxford, Clarendon Press, 1929. ISIS

Reviewed in *Nature*, 124, 832, 1929.

Holmboe, Jens. Gamle Norske Matplanter. *Avhandlinger utgitt av Det Norske Videnskaps-Akademi i Oslo, I. Math.-nat. Kl.* 36 p. Oslo, 1929. ISIS

Reviewed by MARZELL, *Mitteilungen zur Geschichte der Medizin und der Naturwissenschaften*, 29, 22, 1930.

Kelly, Howard Atwood (1858-). Some American medical botan-

ists, commemorated in our botanical nomenclature. 216 p., ports., pl. New York, APPLETON, 1929. ISIS

Leclerc, Henri. Histoire de l'asphodèle. *Janus*, 33, 235-44, 1929. ISIS

Les vertus thérapeutiques de l'asphodèle, qui n'est tombé en discrédit qu'au XVIII[e] siècle. L. G.

Meyer, Erich. Beitrag zur Entwicklungsgeschichte der Phytopathologie und des Pflanzenschutzes. Unter besonderer Berücksichtigung folgender Krankheiten : Honigtaukrankheit, Mehltaukrankheit, Mutterkorn, Russtau, Rost des Getreides, Brand des Getreides. *Archiv für Geschichte der Mathematik, der Naturwissenschaften und der Technik*, 12, 146-87, 1929. ISIS

Ruska, Julius. Altes und Neues vom Kaffee. *Die Medizinische Welt*, Nr. 13 u. 14, 13 S., 1929. ISIS

1. Der Kaffee bei den Orientalen; 2. Kaffee und Kaffeehäuser in den europäischen Grosstädten; 3. Chemische vom Kaffee; 4. Heilkräfte des Kaffees.

Stapf, O. Index Londinensis to illustrations of flowering plants, ferns and fern allies : being an emended and enlarged edition continued up to the end of the year 1920 of PRITZEL's alphabetical register of representations of flowering plants and ferns ; compiled from botanical and horticultural publications of the XVIIIth and XIXth centuries. Prepared under the auspices of the Royal Horticultural Society of London at the Royal Botanic Gardens, Kew. Vol. 1. XX+547 p. Oxford, Clarendon Press, 1929. ISIS

Turner, H. H. The long-period terms in the growth of trees. *Monthly Notices of the Royal Astron. Soc.*, 80, 793-808, 1919-20. ISIS

« The evidence for the two periods of 284 years and 303 years is thus nearly as good as can be at present obtained. »

29. — ZOOLOGY.

Gates, Georgina Stickland. The modern cat, her mind and manners : an introduction to comparative psychology. XII+196 p., 4 pl. New York, MACMILLAN, 1928. ISIS

Gudger, E. W. An adult pug-headed brown trout, Salmo fario, with notes on other pug-headed salmonids. *Bulletin of the American Museum of Natural History*, 58, p. 531-59, 19 fig., 1 pl., 1929. ISIS

This is a development of an earlier paper of the same author on GUILLAUME RONDELET's pug-headed carp, the earliest record, 1554. (See *Isis*, 11, 442).

Gudger, E. W. The distibution of Ruvettus, the oil-fish, throughout the South Seas, as shown by the distribution of the peculiar wooden hook used in its capture. *The American Naturalist*, 62, 467-77, 3 fig., 1928. ISIS

Gudger, E. W. How the laughing gull, the feathered buccaneer of Florida waters, gets its dinner. *Scientific Monthly*, 29, p. 435-39, 3 fig., 1929. ISIS

Gudger, E. W. More rains of fishes. *Annals and Magazine of Natural History*, 3, 1-26, 2 fig., 1 pl., 1929. ISIS

« In my earlier paper about forty-eight accounts of rains of fishes were recorded. In this article about twenty-three new cases are cited. » « The seventy-one records here quoted of rains of fishes from fifteen countries (counting England, Scotland, and Wales as one country—Great Britain) encircling the globe, their time-limits covering the two thousand years from ATHENAEUS (circa 200 B.C.) to MCILHENNY (1921 A.D.) leave no ground for doubts as to their occurrence, or for belief that one writer was influenced by another. And for these ' rains ' the explanation uniformly given (and the only one tenable) is that of the whirlwind or waterspout. Unfortunately, I have never seen a rain of fishes, but I unhesitatingly believe in the phenomenon and in its waterspout explanation. »

Gudger, E. W. Rubber bands on mackerel and other fishes. *Annals and Magazine of Natural History*, 4, p. 405-11, 1 pl., 1929. ISIS

Gudger, E. W. Some instances of supposed sympathy among fishes *Scientific Monthly*, 28, p. 266-71, 1929. ISIS

Gudger, E. W. A three-eyed haddock, with notes on other three-eyed fishes. *The American Naturalist*, 62, 559-70, 6 fig., 1928. ISIS

Gudger, E. W. An unusually large (53 mm.) two-headed brook trout, *Salmo fontinalis*. 10 p., 3 fig. *American Museum Novitates*, no. 369, New York, Sept. 1929. ISIS

Gudger, E. W. Voracity in fishes. How fishes, in their search for food, occasionally choke on finny prey too large to be engulfed. *Natural History*, 29, 651-55, 5 ills., 1929. ISIS

Gudger, E. W. Wide-gab, the angler fish. How the all-mouth (*Lophius piscatorius*) sometimes attempts more than it can accomplish. In-

stances in which it has tried to swallow geese and sea gulls. With three drawings by LYNN BOGUE HUNT. *Natural History*, 29, p. 155-59, 1929. ISIS

Howard, Henry Eliot. An introduction to the study of bird behaviour. XII+136 p., 11 pl. Cambridge, University Press, 1929. ISIS

Reviewed in *Nature*, 124, 523-25, 1929.

London Zoological Society. List of the vertebrated animals exhibited in the gardens of the Zoological Society of London, 1828-1927. Centenary edition in 3 volumes. Vol. 1. Mammals. By S. S. FLOWER. IX+419 p. Vols. 2 : Birds. By G. CARMICHAEL LOW. VIII+832 p. London, Zoological Society of London, 1929. ISIS

Pax, F. Über das Aussterben der Gattung Parnassius in den Sudeten. *Zoologische Annalen*, 7, 81-93, 1915. ISIS

Riegler, Richard. Spinnenmythus und Spinnenaberglaube in der neueren Erzählungsliteratur. *Schweiz. Archiv für Volkskunde*, 26, 55-88, 1925. ISIS

Szalay, B. Der grimme Schelch. Über « Glossentiere » und einige Tiernamen, wie Elch, Schelch, Tragelaphus, Bockhirsch, Onager, Waldesel, Brandhirsch, Equicervus. *Zoologische Annalen*, 7, 127-92, 1916. ISIS

« Der Schelch kann nur eine von folgenden 3 Tierarten sein : 1. ein fabelhaftes Tier, 2. das Wildross, 3. der Elch. »

Szalay, B. Der Meerochs. Ein Beitrag zur Geschichte des Zebu, des Büffels, des Elches, der mit « Meer » zusammengesetzten alten Tiernamen usw. *Zoologische Annalen*, 6, 75-111, 1914. ISIS

Szalay, B. Der Wisent in Ortsnamen. Ein Beitrag zur Kenntnis der Verbreitung dieses Tieres sowie des Ures im Mittelalter. *Zoologische Annalen*, 7, 1-80, 1915. ISIS

Tilney, Frederick. The brain from ape to man, a contribution to the study of the evolution and development of the human brain. With chapters on the reconstruction of the gray matter in the primate brain stem, by HENRY ALSOP RILEY. Foreword by HENRY FAIRFIELD OSBORN. Two volumes. New York, HOEBER, 1928. ISIS

Reviewed by FRANCIS R. PACKARD, *Annals of medical history*, 10, 506-8, 1928.

Vandiveer, Clarence A. The fur trade and early western exploration. 316 p., front., pl. port. Cleveland, CLARK, 1929. ISIS

Reviewed by WAYNE E. STEVENS, *American Historical Review*, 35, 173, 1929.

Yerkes, Robert M.; Yerkes, Ada W. The great apes: a study of anthropoid life. XIX+652 p. (Published on the Louis Stern Memorial Fund.) New Haven, Conn., Yale University Press, 1929. ISIS

Zaunick, Rudolph. Die Fischerei-Tollköder in Europa vom Altertum bis zur Neuzeit. Geschichtliche Studien zur angewandten Naturwissenschaft. *Archiv f. Hydrobiologie*, Suppl.-Bd. IV., 527-736, Stuttgart, SCHWEIZERBART, 1928. ISIS

Reviewed by MARZELL, *Mitteilungen zur Geschichte der Medizin und der Naturwissenschaften*, 28, 273, 1929.

V. — SCIENCES OF THE EARTH

(implying knowledge of both organic and inorganic nature)

31. — GEOGRAPHY AND OCEANOGRAPHY.

Bigelow, Henry B. A developing view-point in oceanography. *Science* 71, 84-89, 1930. ISIS

Edwards, Francis. Old maps of the world. 144 p., ill., including 852 items. 83 High St., Marylebone, London, 1929. ISIS

Honigmann, Ernst. Die sieben Klimata und die πόλεις ἐπίσημοι. Eine Untersuchung zur Geschichte der Geographie und Astrologie im Altertum und Mittelalter. 247 p. Heidelberg, CARL WINTER, 1929. ISIS

A long review of this important work appeared in *Isis*, 14, 270-76. The author has communicated to me the two following corrections: (1) S. 158 Mitte werden die Inseln im Kyrkanischen Meere, die bei MOSES VON CHORENE mit Namen genannt werden (zwei Inseln Namens Dodeis und eine dritte, Salca), fälschlich (nach NALLINO, AL-BATTÂNÎ I 169) als unptolemäisch bezeichnet. PTOLEMAIOS nennt sie V 12, 8 ed. NOBBE νῆσοι δύο ἑλώδεις (lies ὑλώδεις = insulae Silvestri *Geogr. Rav.*, p. 392, 7?), was MOSES CHOREN. zu δωδεις verstümmelt, und VI 9, 8 Τάλκα. (2) Zu S. 188 schrieb mir Prof. DRECKER (30 XI. 1929), er halte waḍ' al-kurra für die richtige Erklärung von wazalgora = « Projektion der Kugel » = ἅπλωσις ἐπιφανείας σφαίρας = « planisphaerium ».

Jefferson, Mark. The geographic distribution of inventiveness. *Geographical Review*, 649-61. 2 fig., 1929. ISIS

Longnon, Auguste (1844-1911). Les noms de lieu de la France; leur origine, leur signification, leurs transformations. Résumé des conférences de toponomastique générale faites à l'École pratique des Hautes-Études, publié par PAUL MARICHAL et LÉON MIROT. 1er fascicule (Noms de lieu d'origine phénicienne, grecque, ligure, gauloise et romaine), 2e fascicule (Noms de lieu d'origine saxonne, burgonde, wisigothique, franque, scandinave, bretonne et basque). 336 p. Paris, CHAMPION, 1920-22. ISIS

Reviewed by H. STEIN, *Le moyen âge*, 32, 178-80, 1921; 34, 264-66, 1923.

Mžik, Hans von. Beiträge zur historischen Geographie, Kulturgeographie und Kartographie, vornehmlich des Orients. VIII+202 p. 4 pl., 7 fig., 6 maps, facs. Leipzig, DEUTICKE, 1929. ISIS

Mžik, Hans von. Beiträge zur Kartographie Albaniens nach orientalischen Quellen. II. Zur Geschichte der okzidentalen Kartographie Nordalbaniens. Von Baron FRANZ NOPCSA. (Aus: *Geologica Hungarica, Series Geologica*, III.) p. 625-703, 7 pl., 39 fig. Budapest, Institutum regni Hungariae geologicum, 1929. ISIS

32. — GEOLOGY, MINERALOGY, PALAEONTOLOGY, MINING.

(For palaeobotany, palaeozoology and palaeoanthropology, see respectively, 28. botany, 29. zoology and 39. prehistory)

Geer, Gerard De. Geochronology, as based on solar radiation, and its relation to archeology. *Annual report of the Smithsonian Institution for* 1928, p. 687-96, Washington, 1929. ISIS

Reprinted by permission from *Antiquity*, 11, no. 7, September, 1928.

Goldring, Winifred. The oldest known petrified forest. *Annual report of the Smithsonian Institution for* 1928, p. 315-24, 9 pl., Washington, 1929. ISIS

Reprinted by permission, with slight changes in the illustrations, from the *Scientific Monthly*, vol. 24, p. 514-29, June, 1927.

Schuchert, Charles. The hypothesis of continental displacement. *Annual report of the Smithsonian Institution for* 1928, p. 249-82, 4 pl., Washington, 1929. ISIS

Reprinted, with slight alterations and additions, from Theory of Continental Drift, 1928, by permission of the author and the American Association of Petroleum Geologists, Tulsa, Okla.

VI. — ANTHROPOLOGICAL AND HISTORICAL SCIENCES

(Knowledge of man, past and present)

34. — ANATOMY.

Artelt, Walter. Geschichte der Anatomie der Kiefer und der Zähne bis zum Ausgang der Antike. *Janus*, 33, 199-212, 1929. ISIS

Detweiler, S. R. Anatomy as a science. *Science*, 70, 563-66, 1929. ISIS

Address delivered at the opening exercises of the College of Physicians and Surgeons, Columbia University, New York, September 25, 1929.

35. — PHYSICAL ANTHROPOLOGY.

(*Anthropometry and races of man*)

Kruse, Walther. Die Deutschen und ihre Nachbarvölker. Neue Grundlegung der Anthropologie, Rassen-, Völker- Stammeskunde und Konstitutionslehre nebst Ausführungen zur deutschen Rassenhygiene. XV+640 p., 17 fig., 5 pl. Leipzig, THIEME, 1929. ISIS

Montandon, Georges. L'ologenèse humaine (ologénisme). XII+478 p., 21 fig., 14 graph., 23 maps, 14 pl. Paris, ALCAN, 1928. ISIS

Reviewed by L. JOLEAUD, *Revue générale des sciences*, 40, 483, 1929; by S. R. STEINMETZ, *Deutsche Literaturzeitung*, 6, 2115-19, 1929.

38. — ARCHAEOLOGY (*Generalities, methods*).

Darmstaedter, Ernst. Antike Münzherstellung und Münzfälschung insbesondere die antiken « Subaeraten ». *Archeion*, 11, LXI-LXVIII, 1929. ISIS

Communication au 1er Congrès international d'histoire des sciences, Paris, 20-24 mai, 1929.

Weyde, A. J. van der. Nederlandsche penningen, uitgereikt in verband met het inenten tegen pokken. *Bijdragen tot de geschiedenis der geneeskunde*, 9, 289-95, 4 fig., 1929. ISIS

39. — PREHISTORY.

Caton-Thompson, G. The southern Rhodesian ruins. *Nature*, 124, 619-21, 1929. ISIS

Childe, V. Gordon. The Danube in prehistory. XX+479 p., 57 pl. Oxford, Clarendon Press, 1929. ISIS

Gregory, J. W. Early Rhodesian mining Zimbabwe. *Nature*, 124, 723, 1929. ISIS

Hrdlicka, Ales. The Neanderthal phase of man. *Annual report of the Smithsonian Institution for* 1928, p. 593-621, 4 pl., Washington, 1929. ISIS

The Huxley Memorial Lecture for 1927. Reprinted by permission, with minor alterations by the author, from the *Journal of the Royal Anthropological Institute* 57, July-December, 1927.

Ischer, Theophil. Die Pfahlbauten des Bielersees. 242 p., 185 fig. Biel, édition de la Heimatkunde-Kommission Seeland, 1928. ISIS

Reviewed by CAMILLE JULLIAN, *Journal des Savants*, 323, 1929.

Kühn, Herbert. Kunst und Kultur der Vorzeit Europas. Das Paläolithikum. 528 p., 120 pl., 8 maps. Berlin, DE GRUYTER, 1929. ISIS

Reviewed by F. ADAMA V. SCHELTEMA, *Deutsche Literaturzeitung*, 6, 2020-23, 1929.

Miller, Gerrit S., jr. The controversy over human « missing links ». *Annual report of the Smithsonian Institution, for* 1928, p. 413-65, 5 pl., Washington, 1929. ISIS

Murray, Margaret Alice. Excavations in Malta. Part 1. With a chapter by G. CATON-THOMPSON. III+49 p., 21 pl. Part 2. With a chapter by G. CATON-THOMPSON. III+43 p., 33 pl. Part 3. With a chapter by C. AINSWORTH MITCHELL and THOMAS J. WARD. IV+38 p., 35 pl. London, QUARITCH, 1923-25-29. ISIS

Reviewed by V. G. C., *Nature*, 124, 719, 1929.

Muskens, L. J. J. Praehistorische trepanatie. *Bijdragen tot de geschiedenis der geneeskunde*, 9, 237-44, 9 fig., 1929. ISIS

Osborn, Henry Fairfield. The discovery of tertiary man. *Science*, 71, 1-7, 1930. ISIS

Address of the retiring president of the American Association for the Advancement of Science, Des Moines, Iowa, December 27, 1929.

Renard, Georges François. Le travail dans la préhistoire. 278 p., 24 fig. Paris, ALCAN, 1927. ISIS

Reviewed by CAPITAN, *Journal des Savants*, 325-26, 1929.

Somerville, Boyle. Instances of orientation in prehistoric monuments of the British Isles. *Archaeologia*, 73, 193-224, 16 fig., 1923. ISIS

« In the preceding paragraphs there have been brought before the reader five different types of megalithic monuments, and several examples of each type, in which there is undoubted evidence of exact orientation to certain definite points of the horizon, such orientation being conveyed either in the groundplan of each monument, in its geographical surroundings, whether artificially marked or not, or by both methods. This is an initial contribution to the study of the subject, and contains merely leading and obvious examples from the collection of about ninety surveys of separate megalithic monuments made by the writer. The time has not yet arrived to state definitely that orientation of some kind, solar, stellar, or lunar, is to be found in all such structures; but in every instance in the above-mentioned small collection, where the ruined remains have been sufficiently extensive to justify a deduction of any sort, orientation of one kind or another has been found. »

Williams, Herbert Upham. Human paleopathology, with some original observations on symmetrical osteoporosis of the skull. *Arch. of Path.*, 839-902, 1929. ISIS

Reviewed by SUDHOFF, *Mitteilungen zur Geschichte der Medizin und der Naturwissenschaften*, 29, 39, 1930.

40. — ETHNOLOGY (*Primitive and popular science*).

Allier, Raoul. The mind of the savage. Translated by FRED ROTHWELL. XIV+301 p. London, BELL, 1929. ISIS

Bunzel, Ruth L. The pueblo potter : a study of creative imagination in primitive art. VIII+134 p., 38 pl. (*Columbia University contributions to anthropology*, ed. by FRANZ BOAS. vol. 8). New York, Columbia University Press, 1929. ISIS

Bushnell, David I., Jr. Mounds and other ancient earthworks of the United States. *Annual report of the Smithsonian Institution for* 1928, p. 663-85, 12 pl., Washington, 1929. ISIS

Collins, Henry B., Jr. Prehistoric art of the Alaskan Eskimo. 52 p., 24 pl. Washington, Smithsonian Institution, 1929. ISIS

« In the foregoing review we have examined the art of the ancient Bering Sea culture, the features that distinguish it from the later Punuk phase on St. Lawrence Island, and its relation to that of the present Alaskan Eskimo and the extinct Thule culture of the East. Since it seems clearly to have antedated the Thule culture, the oldest of which we have definite knowledge in the eastern regions, it may be said to represent the oldest known stage of Eskimo culture. It is far from being a primitive culture especially in art, that has appeared in the Arctic or sub-Arctic regions; and its discovery,

instead of clarifying the problem of the origin of Eskimo culture as a whole, has only resulted in showing that we must go much further back before that origin is revealed.» «The enormous and practically unknown stretch of coast from Indian Point northward to East Cape and thence westward to the Kolyma seems the most likely region in which to search for the beginnings of the ancient Bering Sea culture, which in its later stages produced in Alaska an Eskimo culture of unparalleled richness, gave rise to the highest Eskimo culture of the eastern regions, the Thule culture, and formed the basis of the existing culture of the Eskimo of Alaska and Siberia.»

Fettweis, Ewald. Über die erste Entstehung der einfachen geometrischen Formen. *Archiv für Geschichte der Mathematik, der Naturwissenschaften und der Technik*, 12, 113-21, 1929. ISIS

Genet, Jean. Histoire des peuples Shoshones-Aztèques (Amérique du Nord et Amérique Centrale). 352 p., Paris, GENET, 1929. ISIS

Avec une patience qui ne se lasse pas, JEAN GENET accumule, traduit et édite les documents relatifs aux anciennes civilisations du Mexique et de l'Amérique Centrale, et les élabore pour en faire une histoire, certes encore bien fragmentaire, mais dont les éléments sont infiniment précieux. On lui doit une *Esquisse d'une civilisation oubliée* (le Yucatan à travers les âges), la publication du texte quiché et la traduction du *Livre du conseil des Quichés* l'édition et la traduction de la *Relacion de las cosas de Yucatan* (2 vol.), de DIEGO DE LANDA, l'édition et la traduction de la *Descripcion de la ciudad de Mexico antes y despues de la llegada de los conquistadores españoles*, de ANTONIO DE LEON Y GAMA; il a écrit en collaboration avec PIERRE CHELBATZ une *Histoire des peuples Maya-Quichés* (1927); on a de lui encore des *Notes d'archéologie et d'histoire Maya-Quichés*, une *Histoire des peuples civilisés du Guatémala*. Et voici celle d'un autre groupement dont on trouve des représentants dans les États-Unis de l'ouest et surtout dans le Mexique central, histoire pour laquelle on possède — du moins pour le groupe aztèque — des documents qui remontent, année par année, jusqu'à l'an 600 (cependant les sources originales de 600 à 1200 sont inédites et n'ont pas fait l'objet d'études critiques), et quelques documents qui remontent jusqu'à 429 avant notre ère (début de l'histoire de l'empire Vieux-Toltèque). L. G.

Krieger, Herbert W. American Indian costumes in the United States National Museum. *Annual report of the Smithsonian Institution for* 1928, p. 623-661, 36 pl. Washington, 1929. ISIS

May, Walther. Die biogenetischen Mythen der alten Kulturvölker. *Zoologische Annalen*, 7, 99-125, 1916. ISIS

Moodie, Roy L. Studies in paleopathology, XXIII. Surgery in pre-Columbian Peru. *Annals of medical history*, 1, 698-728, 20 fig., 1929. ISIS

Olbrechts, Frans M. Some notes on Cherokee treatment of disease. *Janus* ,33, 271-80, 1929. ISIS

41. — SUPERSTITION AND OCCULTISM.

Garçon, Maurice ; Vinchon, Jean. The devil : an historical, critical and medical study. Translated by STEPHEN HADEN GUEST from the sixth French edition. 288 p. London, GOLLANCZ, 1929. ISIS

Gregory, J. W. Water divining. *Annual report of the Smithsonian Institution for* 1928, p. 325-48, 16 fig., Washington, 1929. ISIS

Read at the session of the British Waterworks Association, Public Works, Roads, and Transport Congress, 1927. Here reprinted by permission of the British Waterworks Association. « The survival of the use of the divining rod in the search for water after its many other uses have been abandoned is in my opinion due to shallow supplies of water being scattered abundantly, but so irregularly and elusively that their discovery is often a matter of chance. Some observers are especially quick in detecting the faint clues to their position, and in the areas where diviners are mostly used a large number of successes is inevitable owing to the wide distribution of underground water. »

Hodson, Geoffrey. The science of seership. A study of the faculty of clairvoyance, its development and use, together with examples of clairvoyant research. Diagrams by D. KENRICK. 224 p. London, RIDER, 1929. ISIS

Moll, Albert. Psychologie und Charakterologie der Okkultisten. 130 p. (*Abh. aus d. Gebiete d. Psychotherapie u. medizin. Psychol.* Hrsg. v. ALB. MOLL. H. 11.) Stuttgart, ENKE, 1929. ISIS

Reviewed by KARL BIRNBAUM, *Deutsche Literaturzeitung*, 6, 2273-74, 1929.

Summers, Montague. The vampire in Europe. XII+330 p. London, KEGAN PAUL, 1929. ISIS

43. — SOCIOLOGY, JURISPRUDENCE AND POSITIVE POLITY.

Gosney, Ezra Seymour ; Popenoe, Paul. Sterilization for human betterment. A summary of results of 6.000 operations in California, 1909-1929. XVIII+202 p. London, MACMILLAN, 1929. ISIS

Le Corbusier-Saugnier. The city of to-morrow, and its planning. Translated from the eighth French edition of *Urbanisme*, with an introduction by FREDERICK ETCHELLS. XXVII+302 p. London, RODKER, 1929. ISIS

Libby, Walter. Introduction to contemporary civilization. An orien-

tation course for college students. XIII+272+XIX p. New York, KNOPF, 1929. ISIS

The author of this book is too well known to our readers to require any introduction. He was one of the pioneers of the history of science movement in the U. S., and has written two textbooks on the subject *An introduction to the history of science* (1917) and *The history of medicine in its salient features* (1922; *Isis*, 5, 478), which are widely used. The present volume is of different and wider scope. Says the jacket, « Intended for use in college orientation courses, the book aims to give a picture of the present-day world as a development out of the past. It traces influences in the fields of the physical and natural sciences, economics, government, psychology, and esthetics, to their present results. » In fact it is a sort of brief encyclopaedia of the main features of our civilization, as may be best illustrated by quoting the titles of a few chapters : 1. Idea of progress; 2. Development of the occupations; 3. Selection of plants and animals; 4. Races of man; 5. Artificial selection applied to man; 6. Foreign and domestic trade; 7. War and the economic struggle; 8. Development of international law; 9. Law and justice; 10. Preventive medicine and the tropics; 11. Industrial revolution; 12. Transportation and telegraphic communication, etc., etc. Each chapter is followed by a short bibliography, and by « questions, suggestions for independent study, and topics for discussion or debate. » G. S.

Poète, Marcel. Introduction à l'urbanisme. L'évolution des villes. La leçon de l'antiquité. 364 p., 32 pl., Paris, BOIVIN, 1929. (35 fr.). ISIS

Cet ouvrage est consacré à une matière neuve. L'auteur traite de la science des villes et cherche dans le passé les raisons du présent. Il caractérise ainsi des types de villes qu'il nomme; la cité divine (les villes égyptiennes), la cité du despote (villes chaldéo-assyriennes), la cité démocratique (Athènes), puis il étudie les villes grecques, les villes hellénistiques (origine, forme, évolution, systèmes routiers, etc.), et trouve dans les villes hellénistico-romaines les traits naissants de la ville moderne. L. G.

Zwilgmeyer, Franz. Die Rechtslehre SAVIGNYS. Eine rechtsphilosophische und geistesgeschichtliche Untersuchung. XII+64 p. (*Leipziger rechtswiss. Studien*. Hrsg. v. d. Leipziger Juristen-Fak. H. 37). Leipzig, THEODOR WEICHER, 1929. ISIS

Reviewed by ERIK WOLF, *Deutsche Literaturzeitung*, 6, 2217-21, 1929.

44. HISTORY OF CIVILIZATION.

(General history, historical methods, biography and chronology)

Deutsches Biographisches Jahrbuch. Überleitungsband II : 1917-1920. Hrsg. vom Verbande der Deutschen Akademien. 770 p. Stuttgart, Dtsch. Verl. Anst., 1928. ISIS

Reviewed by HANS HERZFELD, *Deutsche Literaturzeitung*, 6, 1737-38, 1929.

Leland, Waldo G. L'organisation internationale des études historiques. Extrait de l'Histoire et historiens depuis cinquante ans, methodes, organisation et résultats du travail historique de 1876 à 1926, p. 741-56, Paris, ALCAN, 1930. ISIS

Steinhausen, Georg. Geschichte der Deutschen Kultur. 3. gänzl. neubearb. Aufl. x+685 p., 151 fig., 15 pl. Leipzig, Bibliograph. Inst., 1929. ISIS

1st ed., 1904; 2nd in 1913.

45. — HISTORY OF ART.

(Art and science. Iconography. Arts and crafts)

Algoud, Henri. La soie, art et histoire. 256 p., 24 fig., 16 pl. Paris, PAYOT, 1928 (60 fr.). ISIS

Travail de vulgarisation, dans lequel on chercherait en vain par exemple des renseignements circonstanciés sur le chemin suivi par le précieux cocon depuis la Chine jusqu'en Occident; un seul fait précis est signalé, et encore sa date (555) n'est-elle pas donnée : la remise à l'empereur JUSTINIEN, par deux moines, d'une collection d'œufs de verre à soie. L'histoire de la technique de la soie en France occupe près des deux tiers du volume. L. G.

Meyer, Kathi ; Hirsch, Paul. Katalog der Musikbibliothek PAUL HIRSCH, Frankfurt am Main. Bd. I : Theoretische Drucke bis 1800. 299 p., 30 pl. (Veröffentl. d. Musikbibl. PAUL HIRSCH, Frankfurt a. M. Unter Mitwirk. v. P. HIRSCH hrsg. v. JOHANNES WOLF. II. Reihe, Bd. I.). Berlin, BRESLAUER, 1928. ISIS

Reviewed by WILHELM KRABBE, *Deutsche Literaturzeitung*, 6, 2068-70, 1929.

Rupp, Emile. Die Entwicklungsgeschichte der Orgelbaukunst. XVI+480 p., 97 fig. Einsiedeln, BENZIGER, 1929. ISIS

Stenger, Erich. Phelloplastik, die Kleinkunst der Korkbildnerei. *Archiv für Geschichte der Mathematik, der Naturwissenschaften und der Technik*, 12, 1 fig., 194-209, 1929. ISIS

46. — HISTORY OF LANGUAGE, WRITING AND LITERATURE.

Jaberg, K. ; Jud, J. Sprach- und Sach-Atlas Italiens und der Süd-Schweiz. Band 1. Zofingen, RIGIEN, 1928. ISIS

Reviewed by CHARLES BRUNEAU, *Journal des Savants*, 389-97, 1929.

Saudek, Robert. Experimentelle Graphologie. XII+347 p. Berlin, METZNER, 1929. ISIS

Reviewed by KARL BIRNBAUM, *Deutsche Literaturzeitung*, 6, 2080-82, 1929.

Schmidt, P. W. Die Sprachfamilien und Sprachenkreise der Erde. Atlas von 14 Karten (Kulturgeschichtliche Bibliothek. Herausgegeben von W. FAY. 1. Reihe: Ethnologische Bibliothek mit Einschluss des altorientalischen Kulturgebiets). 40×28 cm. Heidelberg, CARL WINTER, 1926. ISIS

Includes the following maps: 1. Die Sprachen von Europa und Asien; 2. Sprachenkarte von Afrika; 3. Die austrische Sprachfamilie in Australien, Indonesien, Ozeanien; 4. Karte der Eingeborenensprachen von Australien; 5. Sprachenkarte von Nord- und Mittelamerika; 6. Die Sprachen von Südamerika; 7. Übersichtskarte der Sprachen des Erdkreises; 8. Die ethnologischen Kulturkreise; 9. Die Verbreitung des Anlautes; 10. Die Verbreitung des Auslautes; 11. Die Verbreitung des Dual und des Trial, von Inklusiv und Exklusiv; 12. Die Verbreitung der Wortklassifikationen; 13. Die Verbreitung der Zahlsysteme; 14. Die Verbreitung der verschiedenen Stellungen des Genitivs.

48. — HISTORY OF PHILOSOPHY

(*See also above* 18. *philosophy of science*)

Bréhier, Emile. Histoire de la philosophie. T. 2, La philosophie moderne. Fasc. 1. le dix-septième siècle. 314 p. Paris, ALCAN, 1929. ISIS

Encore qu'elle avance sur un rythme un peu lent au gré des usagers, l'histoire de la philosophie publiée par EMILE BRÉHIER se poursuit. Le T. 1 comprend 792 p. en trois fasc. respectivement consacrés à la période hellénique (*Isis*, 9, 593), à la période hellénistique et romaine (*Isis*, 11, 555), au Moyen-âge et à la Renaissance. Le T. 2 et dernier comprendra lui aussi trois parties, dont la première, où est traité le XVII^e^ siècle, vient de paraître; les deux suivantes seront réservées, l'une au XVIII^e^ siècle, la dernière au XIX^e^. L'auteur reste fidèle au but qu'il s'est proposé « donner une esquisse aussi claire et aussi vivante que possible » de la pensée toujours vivante, et non pas établir un catalogue complet. Il suffit, pour s'en rendre compte, de lire le chapitre d'introduction du fasc. consacré au XVII^e^ siècle, où est parfaitement mis en relief, dans ce siècle « de la contre-réforme et de l'absolutisme royal », le caractère individualiste de la pensée des auteurs les plus audacieux. « A cet égard, une des productions les plus caractéristiques du siècle est le *De jure belli et pacis* de HUGO GROTIUS, l'auteur de la doctrine du droit de la nature... Partout où MACHIAVEL voyait des conflits de forces individuelles, qui ne pouvaient se trancher que par la violence, GROTIUS voit des relations définies de droit ». 1. Caractères généraux du XVII^e^ siècle; 2. FR. BACON et la philosophie expérimentale en Angleterre; 3. DESCARTES et le cartésianisme au XVII^e^ siècle; 4. PASCAL; 5. TH. HOBBES; 6. SPINOZA, spinozistes et antispinozistes; 7. MALEBRANCHE, les malebranchistes; 8. La philosophie allemande avant LEINBIZ, LEIBNIZ; 9. J. LOCKE, la philosophie anglaise à la fin du XVII^e^ siècle; 10. PIERRE BAYLE et FONTENELLE. L. G.

Whitehead, Alfred North. Process and reality ; an essay in cosmology. (Gifford lectures delivered in the University of Edinburgh during the Session 1927-28). XXIV+509 p. Cambridge, University Press, 1929. ISIS

49. — HISTORY OF RELIGION (*science and religion*).

Hyatt, Harry Middleton. The Church of Abyssinia. 301 p., ills. (*Oriental research series*, edited by JOHN A. MAYNARD). London, LUZAC, 1928. ISIS

« One of the problems that has always faced the expansion of the Christian Church has been how Christianity could be adapted to meet peculiar ethnic conditions and at the same time maintain an identity as well as a continuity with the religion of the historical JESUS. That problem is especially acute in the Far East at the present moment. In the Abyssinian Church, we have a living example of how Christianity was transplanted to African soil and assimilated by an African people. This book however is not concerned with the history of Christianity in Abyssinia but with the institutions and life of the Abyssinian Church. With the exception of ARCHDEACON DOWLING'S pamphlet (1909) and an article by G. K. REIN (1918) nothing even of an introductory nature exists. » In appendix, lists of the emperors and abunas, and Confession of CLAUDIUS (Damot, 1555). G. S.

Pettazzoni, Raffaele. La confessione dei peccati. First part. Being vol. 3 of the series Storia delle religioni. XIV+355 p., 1 pl. Bologna, ZANICHELLI, 1929. ISIS

Reviewed by W. P. Y., *Journal of the Royal Asiatic Society*, 943 ,1929.

Reitzenstein, Richard. Die Vorgeschichte der christlichen Taufe. Mit Beiträgen von L. TROJE. 399 p., pl. Leipzig, TEUBNER, 1929. ISIS

Reviewed by ERNST LOHMEYER, *Deutsche Literaturzeitung*, 6, 1851-60, 1929.

VII. — MEDICINE

50. — HISTORY, ORGANIZATION, AND PHILOSOPHY OF MEDICINE.

Bullock, Fred. Notes on the early history of the veterinary surgeon in England. *Proceedings of the Royal Society of Medicine.* (Section of the history of medicine, 22). p. 627-33, 1929. ISIS

An epitomy of Sir FREDERICK SMITH'S Early History of Veterinary Literature and its British Development (*Isis*, 3, 307-08, 1920-21) with some slight additional data. Emphasis is put upon the work of JOHN HUNTER in encouraging the Veterinary College of 1791 ; after his death in 1793, the College

was soon outstripped by WILLIAM DICK's Edinburgh School (1823). A single body was formed in 1844. H. R. V.

Giordano, Davide. DOMENICO BARDUZZI (5.08.1847-27.02.1929). *Archeion*, 11, 224-7, portr., 1929. ISIS

Hübotter, Franz. Biographisches Lexikon der hervorragenden Aerzte aller Zeiten und Völker. Zweite Auflage. Erster Band, AASKOW-CHAVASSE, mit 64 Bildnissen. XXVIII+897 S., 16 Taf. Berlin, URBAN and SCHWARZENBERG, 1929. (Geh. RM 60, geb. RM 66). ISIS

The great dictionary of medical biography compiled by AGATHON WERNICH, AUGUST HIRSCH, ERNST GURLT and many collaborators (6 vols., Wien, 1884-88) is so well known that it is unnecessary to describe it, and that it will suffice to indicate the merits of this new edition. To begin with, it contains a facsimile reproduction (Manuldruck) with slight modifications of the old volume 1 (713 p.) and of the supplements to it printed in vol. 6 (p. 393-617, 1042-51), all the biographical notices being put in a single alphabetical order. It also includes a collection of 64 portraits, and an unknown number of new notices contributed by the new editor. As we might expect from him, considerably more attention has been paid to Chinese and Japanese medicine. The biographies do not go beyond the chronological limit of the first edition (c. 1880) but it is planned to add one or two volumes which will deal with modern physicians, replace J. PAGEL's Biographisches Lexicon and complete it down to our own days. G. S.

Koopman, J. De vrees voor schijndood in het verleden. *Bijdragen tot de geschiedenis der geneeskunde*, 9, 309-14, 1929. ISIS

Lambert, Samuel W.; Goodwin, George M. Medical leaders from HIPPOCRATES to OSLER. Illus. Indianapolis, BOBBS-MERRILL, 1929. ISIS

Reviewed by FRANCIS R. PACKARD, *Annals of medical history*, 1, 737, 1929.

Neuburger, Max. Das Wiener medizinische Zeitschriftenwesen vor Begründung der « Wiener Medizinischen Wochenschrift ». 9 p. *Wiener Medizinische Wochenschrift*, Nr. 1, 1930. ISIS

Oppenheimer, Heinrich. Medical and allied topics in Latin poetry. London, JOHN BALE, 1928. ISIS

Reviewed by FRANCIS R. PACKARD, *Annals of medical history*, 1, 613-14, 1929.

Schoute, D. De geneeskunde in den dienst der Oost-Indische compagnie in Nederlandsch-Indie. 337 p. Amsterdam, DE BUSSY, 1929. ISIS

Reviewed by M. A. VAN ANDEL, *Bijdragen tot de geschiedenis der geneeskunde*, 9, 296-97, 1929.

Weinberger, Bernhard Wolf. The educational evolution of the dental surgeon. Development and progress toward the formation of the first dental college. *Dental Cosmos*, 1-22, May and June, 1929. ISIS

51 — EPIDEMIOLOGY, HISTORY OF SPECIAL DISEASES, PUBLIC HEALTH AND SOCIAL MEDICINE.

Bologa, Valeriu L.; Ursan, J. Histoire de la variolisation et de la vaccination dans les pays habités par les Roumains. *Archeion*, 11, 26-40, 1929. ISIS

La pratique populaire de la variolisation est très ancienne chez les Roumains. La variolisation scientifique fait son apparition en 1715 en Valachie avec JACOB PYLARINO (1659-1718); la vaccination jennérienne en 1803. L. G.

Doninck, A. van. Geschiedenis der behandeling van de vallende ziekte. *Bijdragen tot de geschiedenis der geneeskunde*, 9, 207-24, 245-53, 1929. ISIS

Hamer, Sir William. Epidemiology old and new. x+180 p. (Anglo-French library of medical and biological science). London, KEGAN PAUL, 1929. ISIS

Reviewed by A. S. M., *Nature*, 124, 435, 1929.

Kleij, J. J. van der. Pokkenbestrijding en pokkenbehandeling in vroeger tijd. *Bijdragen tot de geschiedenis de geneeskunde*, 9, 233-37, 1929. ISIS

Michaëlis, Lorenz. Vergleichende mikroskopische Untersuchungen an rezenten, historischen und fossilen menschlichen Knochen. Zugleich ein Beitrag zur Geschichte der Syphilis. Jena, FISCHER, 1930. ISIS

Rietti, Fernando. Contributo alla storia dell'encefalite epidemica (*encephalitis letargica* di ECONOMO). *Archeion*, 11, 198-205, 1929. ISIS

Schryock, Richard H. The origins and significance of the public health movement in the United States. *Annals of medical history*, 1, 645-65, 1929. ISIS

Sticker, Georg. Entwickelungsgeschichte der spezifischen Therapie. *Janus*, 33, 131-190, 213-34, 245-70, 1929. ISIS

Wickersheimer, Ernest. Civilisation et maladie, d'après un article récent. *Bulletin de la Soc. franç. d'hist. de la médecine*, 23, 31-34, 1929. ISIS

Critique d'un article de H. SIGERIST : Kultur und Krankheit, *Kyklos* 1, 60-63, 1928.

52. — HISTORY OF HOSPITALS AND OF MEDICAL TEACHING.

Goldforb, A. J. Medical and other sciences. An inquiry of what is science? when is it taught scientifically? *Science*, 71, 77-81, 1930. ISIS

Address of the retiring vice-president and chairman of Section N—Medical Sciences, Amer. Ass. Advancement Sc., Des Moines, Iowa, December, 1929.

Leblond, Victor. Le cartulaire de la maladrerie de Saint-Lazare de Beauvais, comprenant 406 chartes conservées aux archives hospitalières de cette ville. CXV+663 p. Paris, CHAMPION et PICARD, 1922. ISIS

53. — PHARMACY. PHARMACOLOGY. TOXICOLOGY.

Fraser-Harris, D. The former importance of our sea-borne trade in drugs. *Medical life*, 36, 548-50, 1929. ISIS

Leo, Julius Friedr. Festschrift zum 350 jähr. Jubiläum der Stadt-Apotheke zum Löwen zu Pirna 1928. Bearb. von HERM. KUNZ-KRAUSE, nebst Beiträgen von H. MUNKELT. Hrsg. von JULIUS FRIEDR. LEO. 154+XII p., port., fig. Pirna, Selbstverlag, 1928. ISIS

Reviewed by ZAUNICK, *Mitteilungen zur Geschichte der Medizin und der Naturwissenschaften*, 29, 48, 1930.

VIII. — EDUCATION

(The methods of accumulating, imparting and diffusing knowledge)

54. — EDUCATION.

(*generalities, methods, colleges, universities*)

Gardiner, Dorothy. English girlhood at school. A study of women's education through twelve centuries. XIII+501 p., pl. Oxford, Univ. Press, 1929. ISIS

Reviewed by PAUL MEISSNER, *Deutsche Literaturzeitung*, 6, 1758-63, 1929.

56. — BIBLIOGRAPHY (*Methods, libraries*)

Indice dei libri proibiti riveduto e publicato per ordine di sua santità Pio Papa XI. Nuova edizione 563 p. Città del Vaticano, Tipografia Poliglotta, 1929. ISIS

This is the first Italian edition of the famous pontifical index. It includes an Italian preface and an Italian translation of the relevant sections of the Canon. But other instructions and the notes are left in Latin. This edition seems thus to represent a transitional stage. Must we conclude from it that the Catholic clergy is forgetting its Latin? G. S.

57. — MUSEOLOGY (*Museums and collections*).

Miller, O. v. Technische Museen als Stätten der Volksbelehrung. 11-27 p., 11 fig. (*Deutsches Museum, Abhandlungen und Berichte*, Heft 5). Berlin, VDI-Verlag, 1929 (Rm. 1). ISIS

What the founder and leader of the Deutsches Museum has to say on museums deserves to be listened to with deep attention. G. S.

59. — ERRATA. Series 20.

(*For previous series, see* Isis, 13, 585, 1930)

Isis

Vol. 1, 649, l. 7 Read Braikenridge.
Vol. 9, 505. Last note. Read Longhena, Mario (not Maio).
653. Read Guyénot, E., vii, 289 (instead of 298 f.).
Vol. 11, 137. l. 3. Read 1824 (instead of 1828).
Vol. 12, 358. Note Blondheim, l. 1. Portuguese text in Hebrew script (instead of Hebrew text).
549. Read Karlgren, B. X 237, XI, 153.
Vol. 13, 111. Article Seemann, l. 10, suppress the word northwestern before Adharbâijân. Marâgha is east of Lake Urmîya, south of Tabrîz.

Introduction to the History of Science
(vol. 1, 1927)

p. 261. Note Xenocrates, l. 5. Read *ἐνύδρων*.
275. Ptolemy's geography. The Greek edition by Nobbe (not Noble) is the least complete.
301. l. 10. Read Dindorf (not Dinsdorf).
322. last line. *Κλειτοφῶντα*.
326. Middle. *Μάρκον*.

335. l. 21-22. Suppress reference to MARCUS GAZENSIS.
353. Note SERENOS. *Ἀντινοεύς*.
481. SIMOCATTES, l. 7. Read *Ταυγάστ*.
496. Geographer of Ravenna, l. 3. Suppress PTOLEMY.
497. last paragraph, l. 1. Amiternum.
637. AL-HAMDÂNÎ, l. 3. Read Ṣifat instead of Ṣifât.
641. l. 2. Read GELZER (not Selzer).
829. SÊBÔKHT, add 449.
830. SEVERUS SÊBÔKHT, see SÊBÔKHT.

Most of these errata relative to the *Introduction* have kindly been sent to us by Dr. ERNST HONIGMANN of Breslau (*Isis*, 14, 270-76).

A few other misprints are not mentioned in these errata because they are too obvious to cause any error or confusion. I wish to express my thankfulness to the readers who take the trouble to make the above-mentioned corrections in their copies of *Isis* and the Introduction. I would advise them, after having accomplished that little task, to write their initials near mine at the bottom of this note, thus to indicate that these and the previous errata have been taken into account. G. S.

These and previous errata have been corrected by...

The corrections have been made in the card index by...

Author's Index to the Twenty-Eighth Bibliography.

The Roman figures refer to centuries ; the Arabic figures, to the sections of parts II and III, which are numbered consecutively from 1 to 59. This index will enable one to find more easily the papers analyzed in the present bibliography, and also to see at a glance what each writer is doing.

February 12, 1930. FRANCES SIEGEL.

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